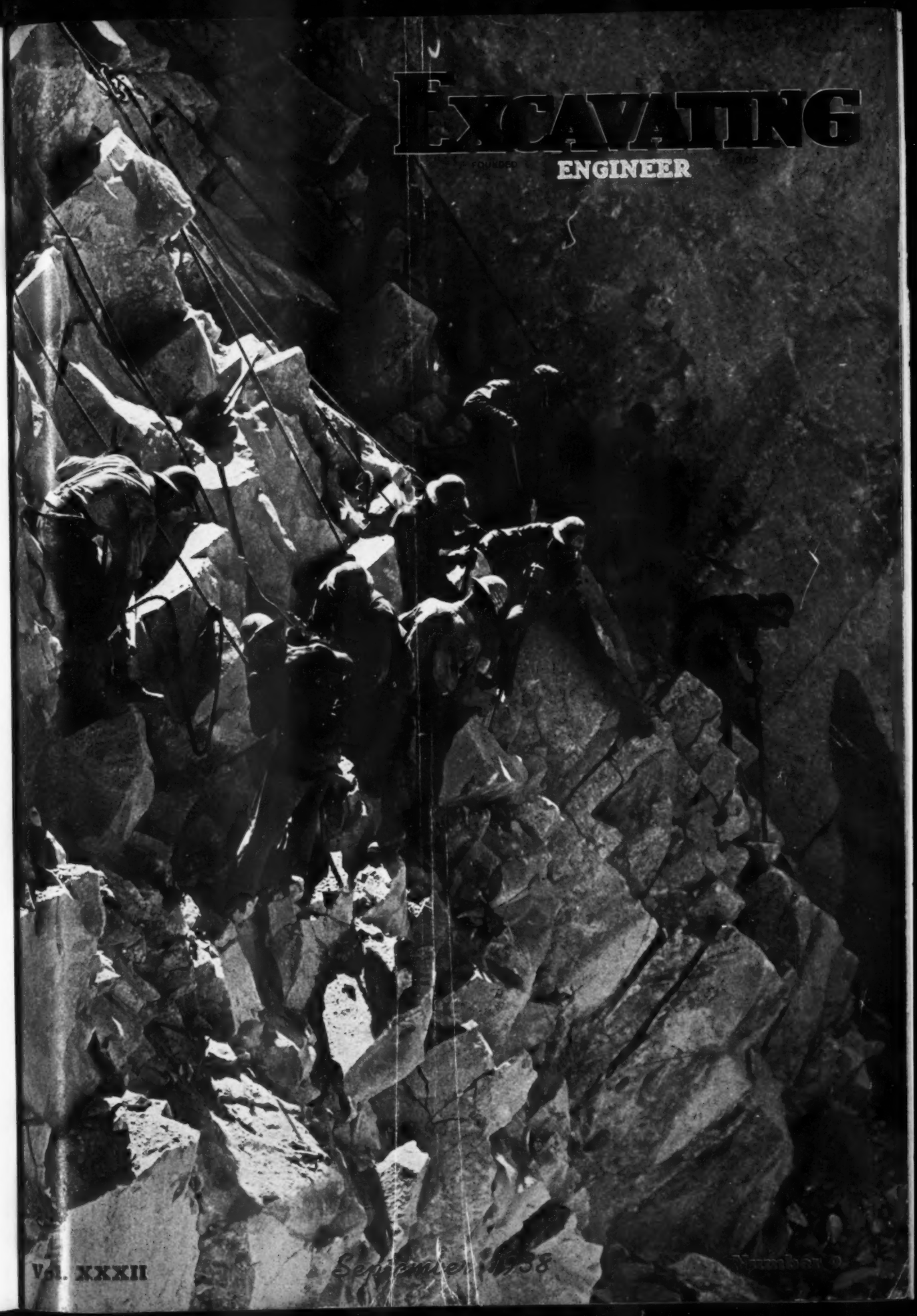

EXCAVATING ENGINEER

Vol. XXXII

September 1938

Number 9

Speaking of Horsepower!

— by Ewing Galloway, N. Y.

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EXCAVATING ENGINEER

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Early Gold Dredging

Here's the story of the first days of mining placer gold with dredges in the Montana deposits.

County Road Work

Clay County, Missouri, finds 3½-yard scraper a handy all-around tool for road work.

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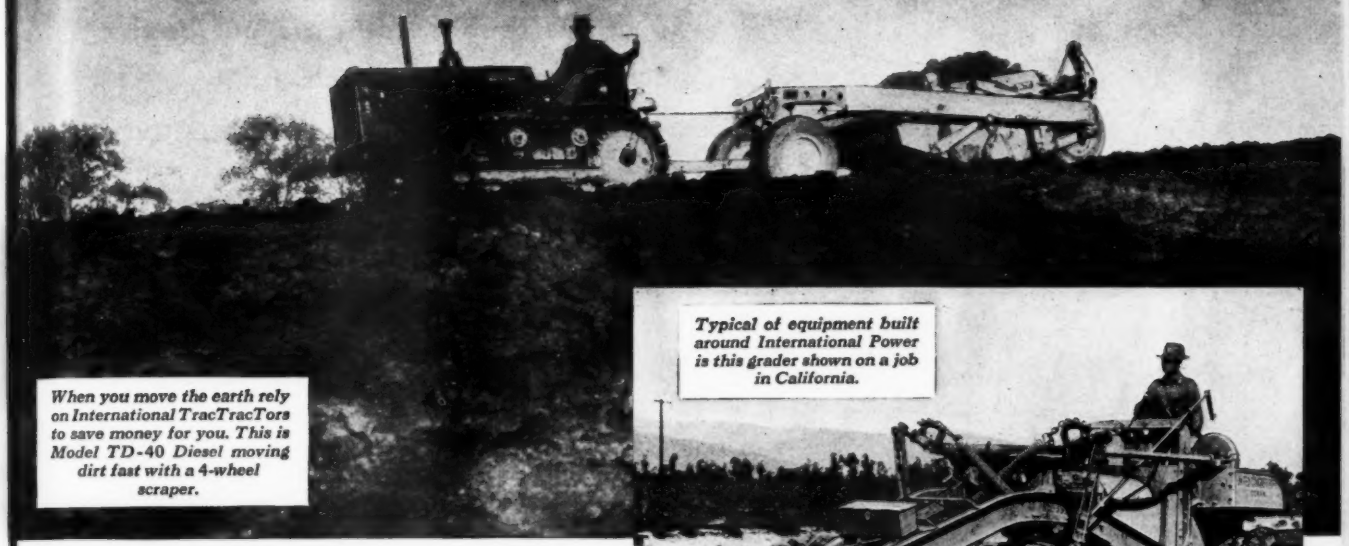

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Typical of equipment built around International Power is this grader shown on a job in California.

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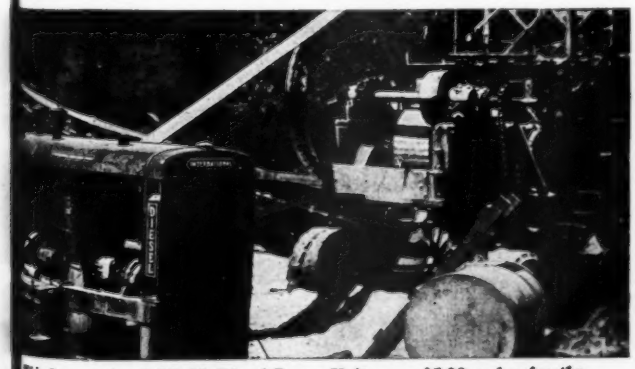


This International PD-80 Diesel Power Unit saves $5.30 a day for the owner of this rock crusher compared to the power it replaced. It has also increased production 75 to 100 cubic yards a day.

The International ID-40 Diesel Tractor provides the economy of the International Diesel engine where a wheel-type tractor is wanted.

INTERNATIONAL Industrial Power

Here are two of the four 9-inch drills operating at No. 1 pit at Fidelity. Between two and three holes, averaging 50 to 55 feet in depth, are put down each 8-hour shift by each drill.

Drilling and Blasting at Fidelity No. 11

United Electric Coal Companies find 9-inch blast hole drills step up results at Fidelity No. 11, near DuQuoin.

LARGEST of four open pit operations now conducted by United Electric Coal Companies, Fidelity No. 11 shipped 1,196,000 tons of coal in 1937. Via the Illinois Central and Missouri Pacific railroads, Fidelity coal is distributed throughout the Middle West. A high quality coal, it is used in approximately equal amounts by railroads, industry and home owners.

Two pits, first opened in 1929, are operated at Fidelity, with a third pit held in reserve. The mine is located near DuQuoin, Illinois, in the largest continuous block of strip coal in the state. About 9,000 acres in this block are controlled by United Electric Coal Companies. Of this total, about 1,000 acres have already been mined.

Overburden at Fidelity No. 11 averages 50 feet in depth, reaches 65 feet fairly often, and touches a maximum of 85 feet. The vein of No. 6 coal, which averages 6½ feet in thickness, is overlaid by a 16-foot stratum of limestone. In some places, slate and shale, up to three feet thick, lie between coal and limestone. Above the latter, the overburden is clay.

9-inch Holes Replace 6-inch

Until December, 1936, 6-inch holes, spaced 19 by 22 feet, were put down. At present, 9-inch holes are drilled by a fleet of seven Bucyrus - Armstrong Model 29 rigs. About 5 per cent of the overburden is now drilled with a Sullivan horizontal drill. This rig is used where the rock layer is less than 10 feet thick, and where there is a protective "blanket" of slate or shale between coal and limestone.

Six of the seven Bucyrus-Armstrongs are used at one time, with the seventh in the shop for a complete overhaul. This policy of having a "relief" simplifies maintenance and helps insure that the rigs in the field will be in tip-top shape. Four drills are at present working at No. 1 pit, and two at No. 2. Holes are put down through the limestone, and average between 50 and 55 feet in depth. Average spacing is 27 by 25 feet, but in heavy rock this is stretched to 26 by 30 feet.

The drills swing 2700 pounds of tools, and each one puts down between 2 and 3 holes per 8-hour shift. Three shifts per day are worked. Drills operate three days a week in summer; five days a week in winter. One driller handles each rig, with an assistant for each two drills. One reason for the continued good footage achieved is the care taken

to maintain the best possible operating conditions. In addition to the thorough overhaul given each drill during its turn in the shop, the drills in the field receive regular inspection. Care is taken to have the rigs firmly jacked at all times so there will be a minimum of vibration.

Macwhyte ¾-inch, 6 by 19 Hi-Lastic wire rope is used on the drills, and has given excellent service, according to Fred Huff, mine manager. One of these lines recently drilled 10,200 feet of hole, of which 2,664 feet was through rock.

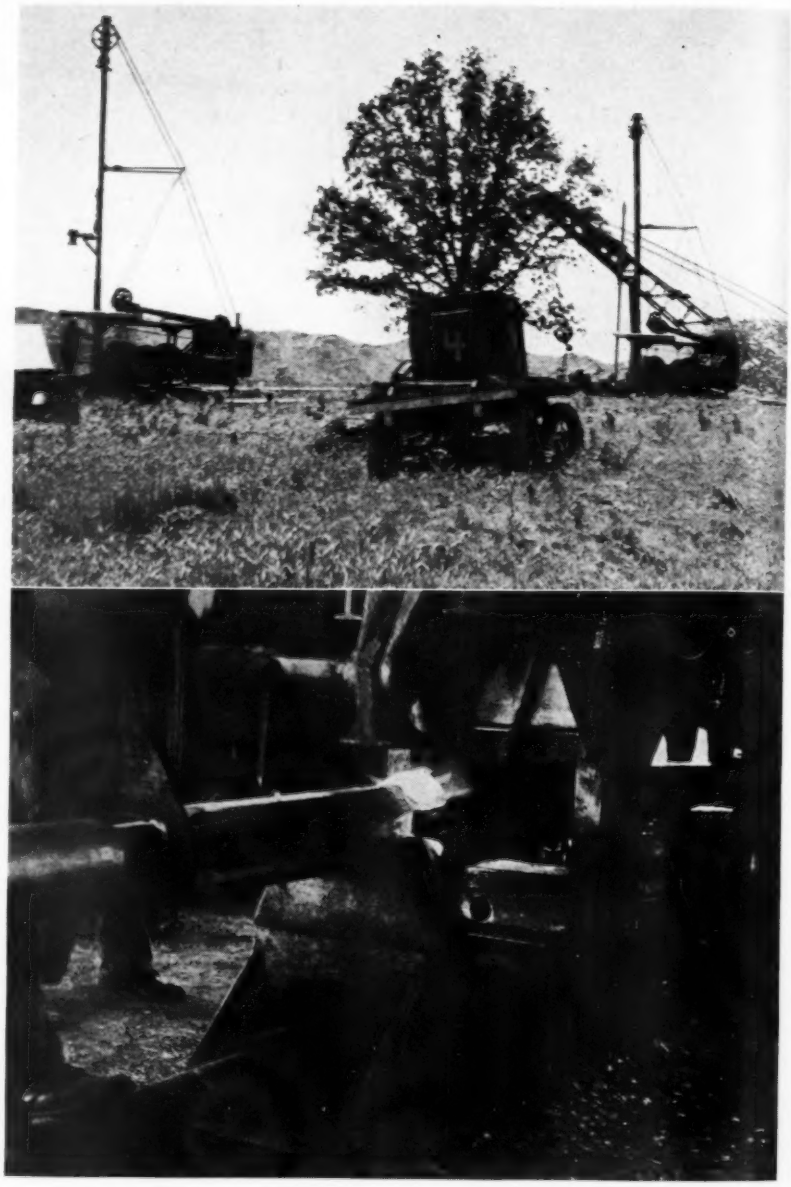
LOX For Blasting Made at Mine

The 9-inch holes are shot with LOX which is made at the mine. Seven-and-a-half inch cartridges, containing 32.81 pounds of effective explosive per cartridge, are used. In general, one cartridge is used for each three feet of rock to be blasted. In March, April and May a total of 1643 holes were drilled, and 6820 cartridges were used to fire them, giving an average of 4.15 cartridges per hole for the three-month period.

Horizontal holes are fired with 4½-inch LOX cartridges. The explosive is carried out to the pits in special boxes mounted on pneumatic-tired chassis which are pulled by the truck which serves the drills with bits.

Shooting is always done against a 50-foot face of previously shot material, as a buffer for the shot. Where ground conditions are favorable, four holes are fired in one blast. In sandy, wet conditions, it is sometimes necessary to shoot single holes. In shooting "singles," the corner hole is always fired first. It is occasionally necessary to case the holes when ground is exceedingly wet and sandy. The casing is pulled after loading, and re-used. Shots are fired with a blasting machine and a number 8 cap specially made for the LOX.

Comparing results achieved with 9-inch holes and those with the 6-inch, it appears that: 1—The 9-inch can be put down as fast as the 6-inch, due to increased weight of tools; 2—about the same total amount of explosives are used; 3—the larger diameter holes make possible a greater concentration of explosive, and fewer holes are needed; 4—this greater concentration gives a much better blast, with greater fragmentation, displacement and heaving of the limestone; 5—cubic yards broken per foot of holes drilled is 35 per cent greater with the 9-inch holes than it was with the 6-inch, and the total drilling cost is only slightly higher.

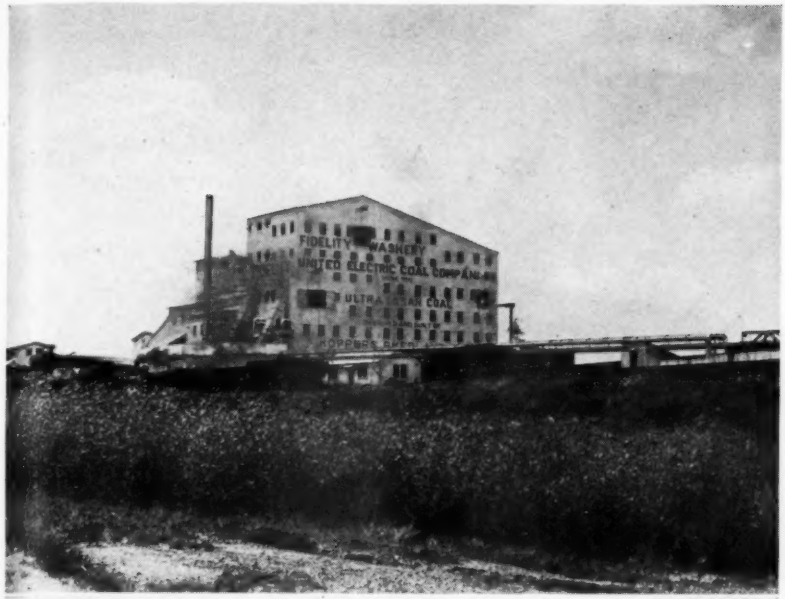


● **Top: Two of the drills working at number 1 pit, with the boom of the 14-yard dragline visible in the background. In the center is one of the chassis on which the LOX is brought out to the drills. Bottom: A 9-inch bit gets sharpened. Ten bits per 7-hour shift are dressed by this electric sharpener.**

According to M. M. Moser, Vice-President in charge of operations, the improved blasting procedure made possible by the 9-inch technique has materially increased the efficiency of the strippers.

Bit Dresser Handles 10 Bits Per Shift

The 9-inch bits are sharpened by a Bucyrus-Armstrong No. 12 electric Bit Dresser located in the



● Top: This modern 8-track Jeffrey tipple and Koppers-Rheolaveur washery can turn out 1,050 tons of coal per hour. Bottom: A 15-yard shovel and 14-yard dragline are shown stripping in tandem. The dragline takes the top soil, the shovel the blasted rock. Note on the spoil pile how the rock is used as a "retaining wall."

shop, near office, tipple and washery. One man and a helper operate the dresser, working one 7-hour for each three 8-hour shifts worked by the drills. The six drills used an average total of eight bits per 24 hours, while the bit dresser can sharpen 10 per 7-hour shift.

The same truck which takes the LOX to the drills, carries the bits to and from the shop. Repair parts are also delivered to the drills by this truck.

A very complete shop is maintained at Fidelity No. 11. In addition to regular welding equipment, the shop is equipped to make all repair parts except castings and gears for drills, strippers, locomotives, etc. With such maintenance equipment available, it has been possible to set up a system cutting lost time to a minimum. With regular, careful inspection, with an ample stock of repair parts on hand, equipment at Fidelity is kept in tip-top shape.

Stripping

Stripping in No. 1 pit is handled by two units. One of these is a Marion 5600 shovel, equipped with a 26-yard dipper. The second unit is composed of a Marion 5480, 15-yard shovel and a 5480 dragline with 14-yard bucket, working in tandem with the shovel. The dragline strips the top layer of clay, casting it behind a "retaining wall" of blasted rock, which is stripped by the shovel. This plan of stock-piling makes it possible to build up steeper banks than would otherwise be possible. Stripping in No. 2 pit is handled by a similar tandem unit of 5480's. Marion Type 490 shovels with 4½-yard dippers handle loading in both pits.

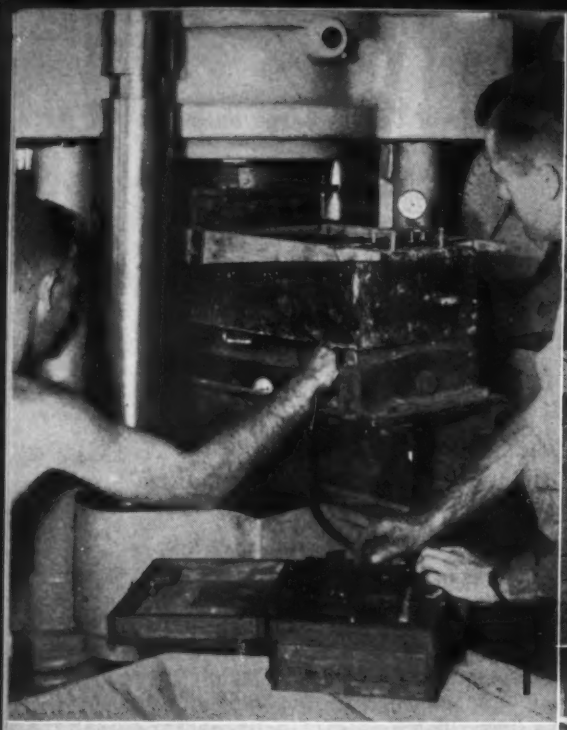
Rail haulage is used, with 40-ton, standard-gage Heisler geared locomotives pulling 5-car trains of 44-ton standard-gage automatic-drop-bottom cars. An 8-track Jeffrey tipple and Koppers-Rheolaveur washery have a combined capacity of 1,050 tons of prepared coal per hour.

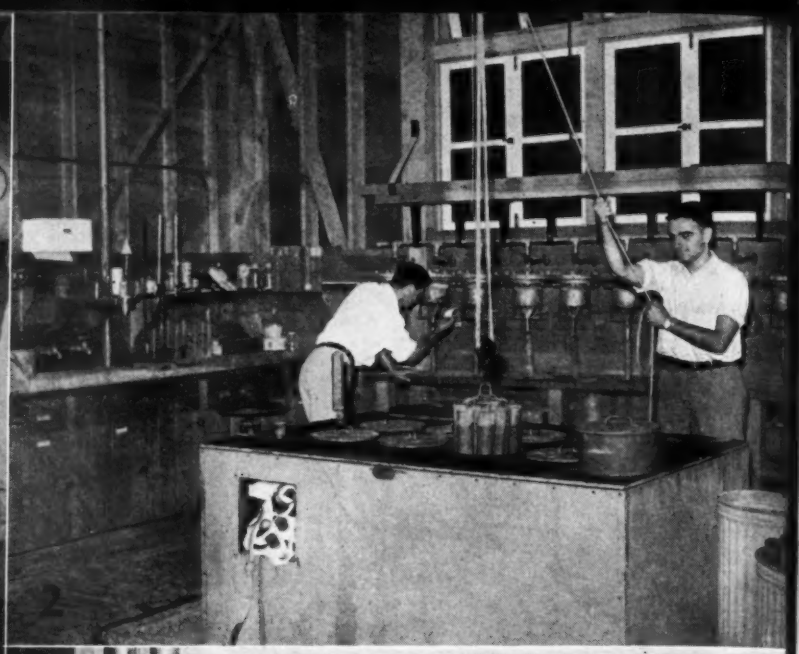
Power for the electric drills, shovels and draglines, and surface plant is purchased from the Illinois-Iowa Power Company.

F. A. Huff is mine manager at Fidelity. Clifford Waymack is assistant manager in charge of No. 1 pit; E. E. Schooley, assistant manager in charge of No. 2 pit. Jack Singhurst is top foreman; G. H. Kilpatrick is drill foreman; Bill Olinger, master mechanic; William Beecham, chief electrician; Carl Huff, shop foreman; and Robert Lourance, timekeeper and clerk. A maximum of 225 men are employed at this mine.

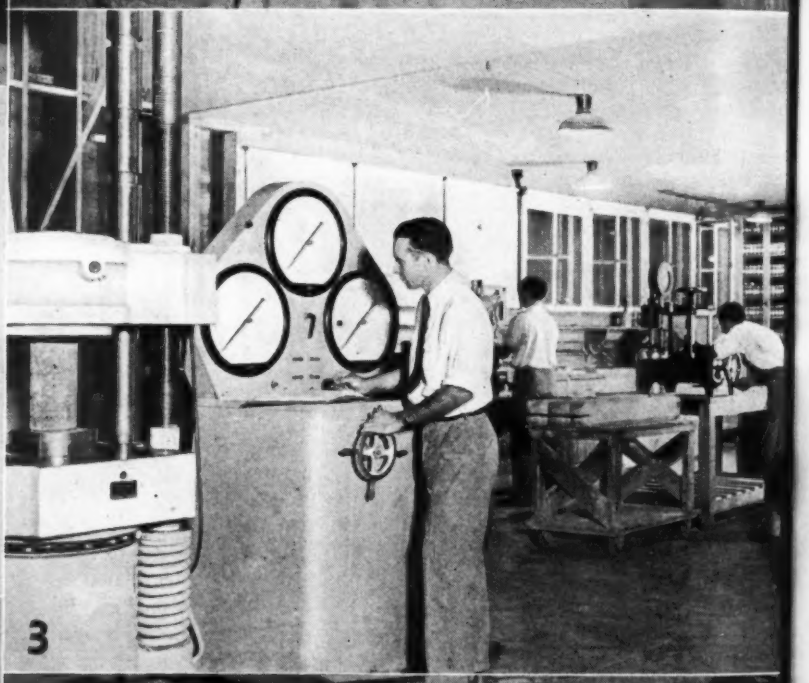
Louis Ware is President of the United Electric Coal Companies; M. M. Moser is Vice President in charge of operations; M. M. Soule is Vice-President in charge of sales; and John V. S. Norton is Secretary-Treasurer.

It is interesting to note that 50,000 trees were planted on the spoil banks at Fidelity this Spring. In cooperation with the State, the company plans a regular program of planting every summer.





Laboratory interiors. 1—Measuring modulus of rupture in concrete. 2—Freezing and thawing tests in foreground; impermeability tests behind. 3—300,000-pound universal testing machine. 4—Curing specimens kept constantly wet at 70 degrees F. 5—One of four controlled temperature and humidity rooms.



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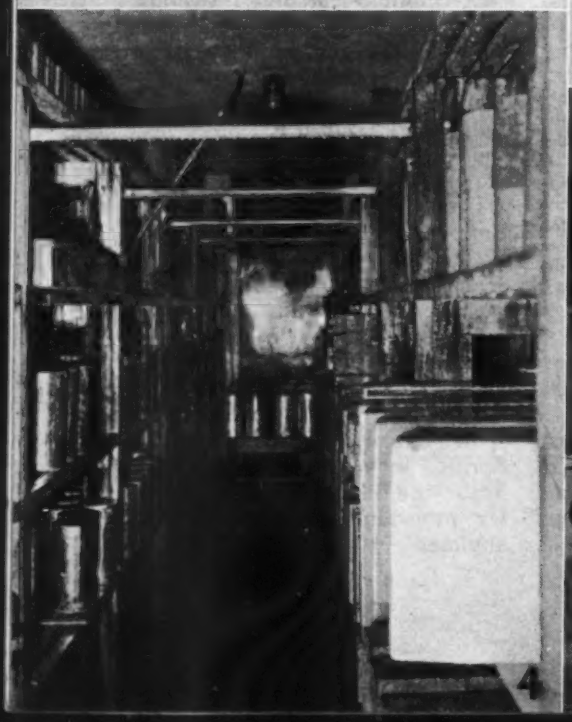

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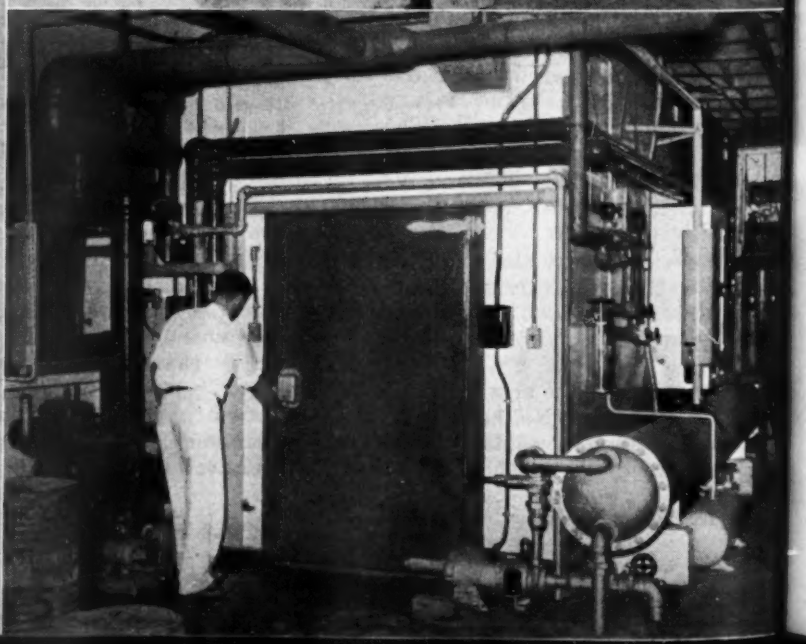


Controlled Concrete

Metropolitan Water District Laboratory at Banning assures uniformity of character in concrete used for Colorado River Aqueduct

By JOHN R. MARCY

IN THE office of the testing engineer in the concrete laboratory of the Colorado River Aqueduct at Banning, California, is a paper weight made from a sample of concrete taken from the job; a block some four inches square, polished to a glass-like surface, containing patches of reds, blues, greens and yellows of the larger aggregates. It is almost unbelievable that ordinary gray concrete is inherently possessed of such beauty and strength and solidity. To the layman, it gives a new impression of what modern concrete really is. Millions of yards of just such material, uniform in character, have gone into the making of the aqueduct, and to a large degree, its quality and uniformity are due to the work of the laboratory at Banning. In addition to this, findings of the laboratory have contributed materially to the production of better concrete, as well as effecting economies for both the Metropolitan Water District and the contractors, by the standardization of efficient field procedure.

At the beginning of the project there were several major problems concerning the concrete for the aqueduct, and their solution became the first principal duty of the laboratory. A great majority of the vast quantity of concrete that would be required would be used under desert conditions and made of aggregate hitherto unproved. The general properties of concrete were, of course, already well known, but almost nothing had been determined as to these properties when subjected to exposure under the arid conditions prevailing and it was considered necessary that more be known about them.

Extensive laboratory and field tests were begun at once, and although all could not be carried to completion before actual placing of concrete was started, sufficiently definite results were obtained in time to establish the desired knowledge and be used as a basis for determining specifications.

In general, it was found that a cement finer ground than ordinary and limited in its content of C3A was best suited to the conditions encountered. Any tendency the finer ground cements may have displayed toward slightly greater shrinkage than the coarser ones was outweighed by their superior workability and greater strength. It was considered well worth while to pay the additional premium of one cent per sack which such specifications added to the cost of the aqueduct cement. Excessive amounts of the compound C3A were found to contribute nothing to the value of the cement. Actually it contributed to increased cracking and lesser durability. Hence its limitation to a maximum of 8 per cent considerably improved the durability and general quality of the concrete.

Aggregate Provides Early Problem

Another major preliminary problem was the source of aggregate. As the aqueduct ran for most of its length through uninhabited, undeveloped desert country, there were no established gravel pits, commercial or otherwise, in the region. Importation from outside sources would have been too costly on account of the

distance and lack of established facilities for its transportation.

Careful prospecting was therefore done along the route of the aqueduct to discover available aggregate deposits. The region was generally well supplied in this respect, and, at practically all points along the line, materials of suitable quality were located. The quality of some 60 deposits was investigated, and the great majority of them were found adequate provided the material was properly prepared and handled. Such requirements were made a part of the specifications and consisted of separating the material into a number of sizes, limitation of the percentage of undersize, elimination of excessive fines in the sand, proper blending of blow and coarse sands for smoother grading and mortar workability, and to a certain extent the avoidance of stock piling. This latter point was not included as such in the specifications, but the specified limitation of undersize at the batcher made the hazard of rejection for this reason due to stock piling too great for most of the contractors. The greater progress and freedom from difficulty due to resulting better uniformity of concrete largely offset objections originally made to this arrangement.

This work, however, so far as the laboratory was concerned, was only the beginning of the aggregate problem. It yet remained to be determined for each deposit what exact combinations of rock, sand, water, and cement would produce the desired results. Materials over the 250-mile line varied so that a somewhat different combination for each kind of aggregate was usually found necessary. This meant an enormous number of tests in order to determine the proportions necessary to produce concretes of the required quality and workability for each aqueduct feature constructed from each deposit. In addition to this preliminary work, specifications for procedure in setting up equipment, mixing, placing, curing, etc., were worked out.

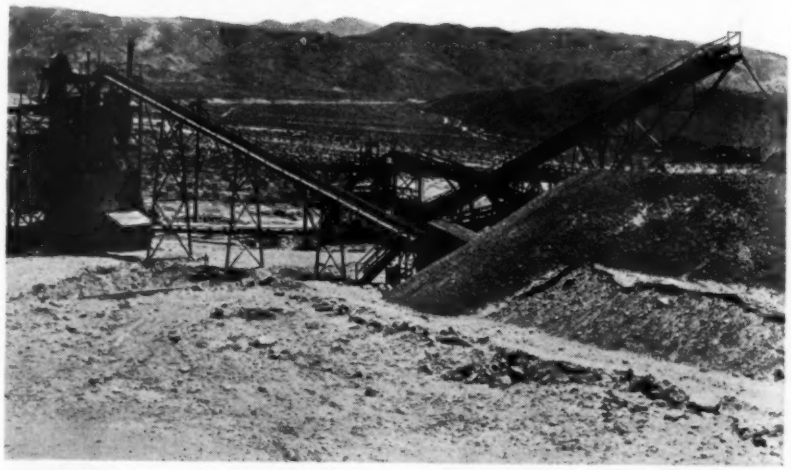
The object of all this, generally speaking, was to insure a quality of materials, and methods of procedure in their use, such that the chances of producing concrete that did not meet requirements would be practically eliminated if specifications and instructions were followed. In this, singular success was achieved, and in no instance did concrete have to be replaced because it fell below the standards.

Curing Complicated by Weather

Another problem which had to be solved preliminary to construction was that of curing. Intense heat and aridity with consequent rapid evaporation, in a region of little water, made this of the utmost importance.

Simply put, the problem of curing is to prevent the loss of free moisture which is originally present in the concrete. During hardening, the cement grains in the cement-water paste which surrounds each particle of aggregate, knit themselves together as water enters into chemical combination with the cement. This process, rapid at first, continues slowly for a long period of time so long as free water is available. If concrete is allowed to dry out in its early stages, the process of hardening is halted and the resulting concrete will be lacking in strength, impermeability and durability. To keep a surface wet for two weeks

● **Top: This combined batcher and aggregate plant near the Aqueduct furnished concrete to trucks which transported it to the scene of operations. Bottom: Cement silos at Mecca, California, furnish a distribution point midway across the desert.**



would have been difficult, especially in the cases of the exposed surfaces of conduit and open canal lining. Moreover, human or mechanical failures in the continuity of a water cure under these arid conditions could seriously affect the quality of the concrete.

From all angles a curing compound was clearly needed that would seal in the original moisture in the concrete for a sufficient period to effect its cure. The difficulty was to find one which would do the work under such severe conditions. During the summers before construction began dozens of materials were tested under actual field conditions with the result that no product then on the market was considered satisfactory. However, the tests showed that two coats of coal-tar cut-back would do the work. To decrease the heat absorption of this black material, two coats of whitewash were applied over it. This method of curing was followed in most places on exposed concrete throughout the construction of the aqueduct.

School for Inspectors

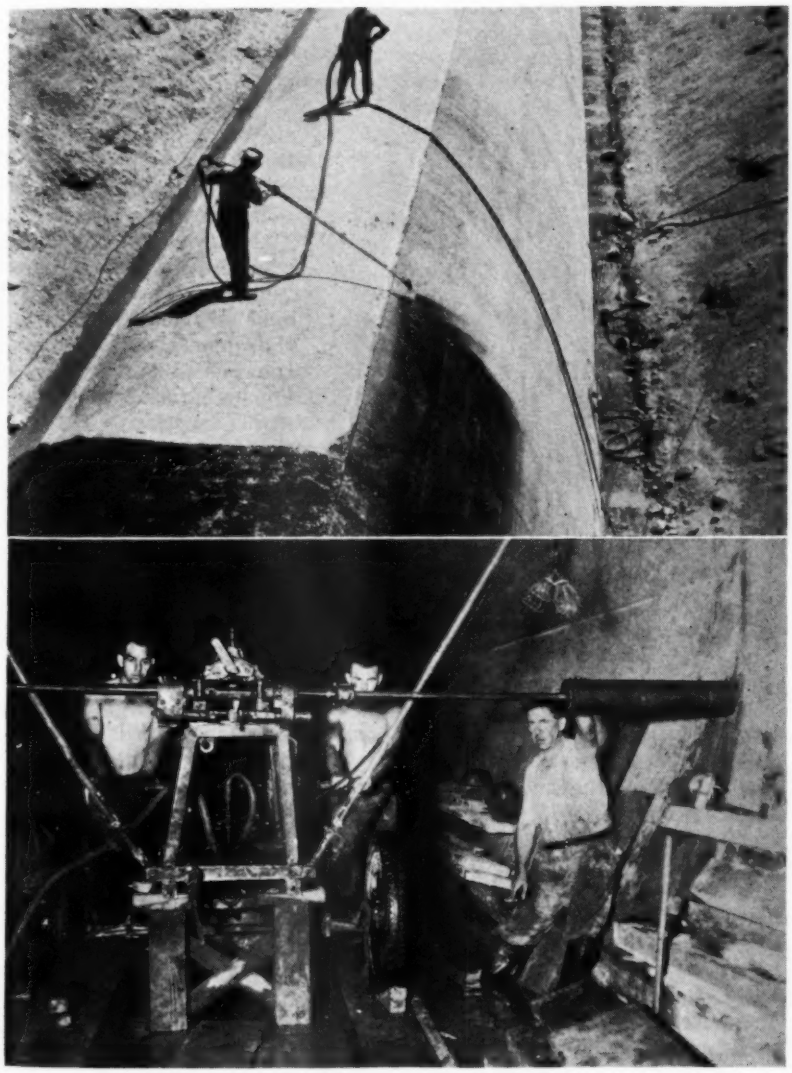
With commencement of construction it was necessary to establish a system of inspection and field testing that would insure the maintenance of the standards which were the intent when specifications were written. To this end an adequate staff of inspectors was selected and given an intensive course of training in the requirements of the work at the testing laboratory. In this "school," still familiarly referred to on the aqueduct as "Banning Tech," a total of 258 men were given instructions in the duties of concrete inspection. Seventeen classes of one week each were held, with 12 to 20 men to a class. An interesting sidelight here in connection with the short time allowed to complete this training was the fact that no sooner would a class "graduate" than a few of the men would get better jobs, either on the aqueduct or elsewhere, in some cases directly because of the improved knowledge they had acquired about concrete.

Most of the men selected as inspectors had different backgrounds of experience, and one of the objectives of the training was to unify these backgrounds into a similar future procedure.

Instructions were given in the simple physics and arithmetic involved in testing cement, aggregate, and batching; correct methods of finishing, troweling, making joints, curing, etc., were demonstrated, and actual practice in making the various inspection tests was practiced at least once by each man.

The inspection system set up by the District, represented by the work of these men in the field supplemented by tests in the laboratory, proved to be sufficiently effective so that it is generally recognized that a considerably better than average concrete job has been accomplished.

● Top: Spraying a whitewash coat over curing compound on exposed conduit helped reduce the temperature. Bottom: Special machine with which sample cores were taken from interior of finished conduit sections.



Inspection at Mills

To make sure that cement met the specifications, inspectors were stationed at all production plants and samples were taken at the mill, sealed in 5-pound cans, and sent to the laboratory at Banning for chemical and physical tests. The plant inspector saw that only cement that had passed the tests was put into the cars for shipment. Into each car he put a signed certification which identified the car at its destination as contain-

(Continued on page 488)

The Old Girl

By IVOR RAMM

Illustrated by J. A. PATTERSON

No man knows where the home office gets its ideas, but Buckets and Greasy Pete carry out orders — as far as they can.

THE OLD GIRL had the place to herself, and she made the most of it.

For some insane reason known only to the home-office engineers, Dolostone, Inc., had decided to strip a pit out in the prairie, a dreary half-mile from the present workings. Quality was supposed to be the answer—better rock for special purposes—and the Old Girl didn't question it, for hers was but to dig and dig.

So with an arroyo for a dumping place, and an expanse of sage-brush prairie into which to sink her stellited teeth, the old dragline dug.

The cycle continued with unrelieved monotony. Her battered one-yard bucket dropped into the tough red earth with a whine of cable, thud of teeth and clatter of chains. Her 150-horse-power Ultimate Six engine roared through six straight exhaust pipes protruding from the roof of her cab. The treads groaned as the bucket was dragged full. With squealing sheaves, the Old Girl hoisted her straining load, swung shakily around, dropped the red earth off into the arroyo from the end of her 70-foot boom, and shimmied around to dig again.

Yard after yard of dirt went into the dump as the Old Girl toiled steadily. Her engine roared and spat and roared, her cab panels rattled, her boom quivered, her treads wobbled, but the Old Girl spent the gray winter morning digging as she had dug, off and on, for a dozen years.

A million yards, a yard at a time, she had stripped off Dolostone's gray rock.

The Old Girl's vigorous, though shaky, performance was inspired by one "Buckets" Brown, a small, wiry, nonchalant individual who teetered at the control levers—"teetered" because the Old Girl's makers had had scant regard for the cause of her future operators and had designed the machine to be handled from a standing position. There was no leather-upholstered seat; in fact, there was no seat of any kind. Thus the agile Buckets was compelled to stand first on the drag-brake pedal, and then on the hoist-brake pedal, and sometimes on both or neither, all the while manipulating drag, swing and hoist clutch levers with his hands.

Welding equipment was always carried.

But Buckets had an even deeper grievance, which he expressed to interested visitors as "havin' to keep a fellow's wires crossed." Further inquiry would evoke a profane explanation about how the hoist clutch lever was on his left hand and the hoist brake pedal under his right foot, and vice versa for the drag controls, a feature which had been the emotional ruin of the few visiting operators who had the temerity to ask for a turn at the Old Girl's controls.

Well, from all this you will see that the Old Girl had a trick or two up her center pintle, and that Buckets Brown was probably the man who could tell you what they were.

Greasy Pete, the oiler, was the first to see the company car careening over the sagebrush from the general direction of the plant. This was not unusual, for Greasy Pete saw everything. He saw the car from the corner of his pale blue eyes as he squinted over his shoulder while jabbing grease into a drive tumbler on the cats. He expectorated an insolent stream of tobacco juice towards the oncoming car, straightened his long back and waved a huge paw, properly begrimed, towards the cab.

The flapping of this object awakened Buckets from an operator's automatic dreamland. As he swung around with a load of dirt he noted, with a grimace, the automobile stopping just beyond the boom radius, and a dapper, black-overcoated individual stepping gingerly to the red dirt.

In a moment Buckets had joined Greasy Pete on the ground and was endeavoring to hear,

through his engine-deafened ears, what Dolostone's timekeeper had to say.

"Just got a wire from K. C. tellin' you guys to move your wreck back to Number Two pit."

"Huh—what you say?" The timekeeper's words, above the hiccoughing of the Ultimate Six, which was in the spasms of idling, sounded garbled to Buckets.

"'K. C.,'" shouted the timekeeper, "says go back to Number Two pit!"

"Why — the doggone stuffed shirts! We just been out here a week. What do they think this old outfit is, a bicycle?'" Buckets was indignant.

Greasy Pete spat.

The timekeeper pulled out a silver case, extracted a cork-tipped cigarette, lit in in the lee of the cats, and shrugged his shoulders.

"That," he said, "is what they call a change of plans. And the Supe will be watchin' your costs on this move."

"Now, Scotty, you know damn' well we slid off our treads comin' out here. This old wreck—"

"Yeah, I know. And I know somethin' else. I heard the Supe talkin' to a couple of operators in the office the other day and he took down their names. . . . S'long, boys."

Scotty sauntered off, carefully keeping his low shoes out of the soft dirt. The dragline crew watched him with fury in their eyes.

"Old Good News himself," grumbled Buckets. "Every time that sawed-off pen pusher comes out here he brings trouble. Some day I'm gonna cover him with a load of dirt."

Greasy Pete spat. "K. C.'s nuts," he said.

Buckets climbed on the cats, grabbed the handrail along-side the cab.

"You've gotta go back to No. 2 pit."

"Let's get going," he growled. "I'll level off a road outa here and you can throw some of those old ties into that soft place ahead. And, hell's fire, I hope nothin' busts on this bad-luck wagon."

A half-hour later the Old Girl was clattering towards Number Two pit, leaving twin tread ruts in the hard soil behind her. Buckets, up in the cab, clasped the travel clutch lever with both hands and braced himself with one foot against a beam. Greasy Pete was a picture of gangling activity as he circled the machine on the ground, apparently in an effort to watch all tread rollers and tread links at the same time. He also made periodic hazardous journeys under the truck frame to inspect the mysterious collection of bevels and pinions, chains and clutches, shafts and bearings, which urged the machine overland.

And so the Old Girl, her bucket swung neatly on a tight drag rope under her boom, wobbled over the countryside with her Ultimate Six roaring at its best. As the morning sun climbed higher, a prairie wind sprang up in the west, and then began to blow steadily from the north. Buckets turned up his jacket collar as the wide-open cab was swept by chilling gusts, and Greasy Pete pulled a pair of cold oil-soaked gloves from his pocket, drawing them on stoically after a large bite at his tobacco plug.

Into the wind the Old Girl traveled, an orphaned excavator, only one of her model to be made in the days when clutch-operated draglines and shovels were new to the game. Her maker had long since passed into a well-earned oblivion. But a certain sturdiness of construction, combined with numerous patches of boiler plate, kept her on the job.

The dragline moved towards a ravine and Buckets, seeing complications ahead, pulled the soggy end of a hand-made cigarette from between his lips, threw it away and prepared for action. He waved at Greasy Pete, who tossed a few ties into a rut and got ready for a turn. Buckets stopped the machine and wrapped himself around the travel brake wheel. He again pulled back the travel clutch lever and the Old Girl squealed in an agony of tortured metal as one tread dug solidly into the dirt and the other tread strained to turn the machine. Turn she did, along the edge of the ravine, with her cab full in

the wind. Greasy Pete lifted his arms in an "okay" signal and Buckets tried again. This time there was a quick release of tension, the travel brake wheel spun idly and the machine lurched for the ravine with both treads crawling.

Buckets slammed the travel clutch out and swore vividly as the Old Girl stopped. Greasy Pete spat. The wind howled in rising anger, and a gray-brown cloud crept over the horizon, "panhandle way." Buckets jabbed the ignition off and the engine died with a cough and a clatter of the impulse starter.

Buckets' voice swelled as he left no verbal stone untouched to express his fury and his disgust.

"Sure that would have to happen — snapped a damn' reach rod," he shouted, "and snapped it in the teeth of a howlin' duster."

"Hell," agreed his partner.

"Nothin' to do but get after it," Buckets grumbled. "Pete, drop the torch down." (Welding equipment was always carried in the Old Girl's spacious cab.)

Buckets, still muttering a garbled profanity, shuffled on his hands and knees under the truck frame, avoided a sturdy cactus, stamped a heel on an orange-and-black centipede, wiped a chunk of grease off his neck, and peered at the broken reach rod. His guess had been good, as he knew it would be. The rod was broken in an old weld.

The operator pulled a file from his pocket and cleaned both sides of the break. He reached for the welding torch, dangling behind him on its red and green hoses. He shouted, "Open 'er up, Pete," and turned to his work. Staring at the broken rod, he eased himself into a sitting position, sat square upon the cactus, yelped, quickly placed his free hand on the dead centipede, jerked his legs beneath him, shook his hand, started to stand up, and bumped his head roundly on the truck frame. He swore. Pete shouted, "What?" and Buckets screamed invectives on Dolostone's key men, from timekeeper to general manager.

A more leisurely return to a sitting position permitted Buckets to get ready for his work. He turned on the gas, struck his flint before the torch, twisted his controls and brought the flame to a buzzing blue point. Greasy Pete knelt beside him and held the ends of the reach rod together. Buckets jerked his goggles over his eyes, pulled out a length of welding rod, and started to join the two parts.

"Front tumbler's off the treads."

The wind swirled and sucked biting dust with it. The dust and wind whipped under the machine, lashed at the blue flame. Sand and dust and white-hot sparks were blown into the men's faces. Greasy Pete pushed his head up between two beams, where black thick grease fell on his cap but where he escaped the worst of the wind. Buckets grimaced and twisted, but kept the flame moving back and forth over the weld. His face was purple with the wind and spotted with cold sparks. But finally he snapped off the flame, pushed his goggles up on his cap and grunted, "There she is!"

Greasy Pete sighed as he squeezed out from beneath the truck frame, stretched, and squirted a long-overdue stream of tobacco juice. "Damme," he said. "Duster."

Buckets joined him and squinted into the brown blur which surrounded them. The world had become a vast cloud of dust as the wind died down—thick dust in the nostrils and throat, stinging the eyes, coating everything. The machine loomed like a crazy formless derelict, its boom lost in the haze.

"Great country, Pete," remarked Buckets, and added: "For the crawlin' centipedes."

"Let's get goin'," he ordered.

They climbed to the cab. Greasy Pete pulled up the torch and rearranged the tools. Buckets pressed the starter button, turned the controls, and the Ultimate Six sputtered, whined and roared. He stepped to the operator's platform, let in the main clutch, pulled back the travel clutch and eased the Old Girl away from the ravine.

A few minutes later the ancient dragline and her crew were traveling, ghost-like, through the dust storm, now a silent, hideous, red pall that settled upon them in a gagging mass that seemed almost solid.

Greasy Pete on the ground was barely visible as an animated blur to Buckets, but his sudden wild motion to swing to the left was not lost on the alert operator. He twisted the travel brake wheel again, saw the darkness of another ravine to the right and felt the machine quiver. Greasy Pete waved his long arms even more frantically and Buckets squeezed the wheel harder. The machine bumped, clattered. Pete leapt up from the haze, slammed the main clutch lever out, and the Old Girl jerked to a halt.

"Now what's the big idea?" shouted the irate Buckets, peering, blear-eyed, at his partner.

"You're off your treads again —that's all," answered Pete, and

(*Continued on page 486*)

Choose The Right Rope

By RUSSEL B. WILLIAMS, M.E.

HAVING the right wire rope on your excavating equipment is just as important as having an efficient dipper or engine on your shovel. The output capacity, freedom from repairs, cost of operation, and profit you get from your equipment depends just as much on the service you get from your ropes as it does on the functioning of any other important part of your equipment.

The matter of making wire ropes last longer is a matter of using the right ropes in the proper way. Certainly, it is true on the face of it that the proper use of wire rope will assure longer rope life. It is just as true, though not as obvious, that the selection of the correct ropes for given duties will result in better rope service.

The job of specifying a wire rope must begin with an understanding of the conditions under which the rope must work. Abrasive and corrosive influences must be recognized. Forces that promote bending fatigue must be seen. Abrasive operating conditions must be taken into consideration. Many practical considerations must have their effect in determining rope specifications.

In general an abrasive condition is best met by a Lang lay rope of tough material and of a construction that provides large outer wires. Lang lay because in such a rope the abrasion is distributed over a greater area of outer wire surface. It would seem a simple matter, then, to select a rope best suited to withstand abrasion.

But the difficulty is that, as you select tougher materials and larger outer wires you reduce the rope's resistance to bending fatigue. Resistance to abrasion and resistance to bending fatigue vary inversely. You must get a proper balance between the two if the rope is to give maximum service. Nowadays this is not as difficult as it was years ago. There is a way of satisfying these apparently contradictory requirements. That way is to use a preformed rope.

Much of the relatively lower resistance to bending fatigue possessed by a non-preformed wire rope is due to the internal stresses with which the rope must contend. When a non-preformed rope is bent the pure bending stress is intensified by the stressed condition of the rope wires. As wire sizes are increased and tougher material is employed this effect becomes greater. When a rope is preformed internal stresses are removed. And, so, with a performed rope it is possible to employ the larger wire sizes and the tougher materials without so greatly reducing the resistance to bending fatigue.

If the application be one in which a Lang lay rope may be used, that Lang lay rope should be preformed. Lang lay, with all its potential advantages, was never really practical until the art of preforming was introduced. It was too lively, too cranky, for dependable service. Now, in a preformed wire rope the user can have the flexibility and abrasion resistance of Lang lay without the disadvantages formerly associated with it.

In general the greater the action the rope must undergo, the greater the need for a preformed rope. For example, on a power shovel on which the boom line is relatively inactive, a nonpreformed boom line may be quite satisfactory. But the hoist line, which is subjected to continual action, should be preformed.

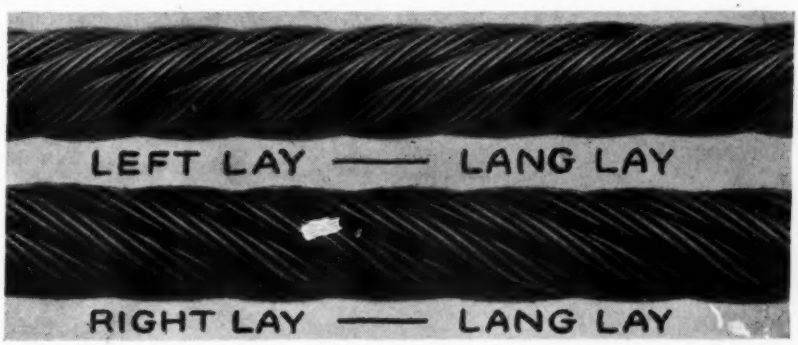
A preformed wire rope, like any other rope, gives its best service when it is operated over sheaves of proper diameter. However, in actual practice, many ropes must be run over sheaves of insufficient diameter. In such a case a non-preformed rope suffers much more than does a preformed rope. The fatiguing effect is of much greater intensity.

The coming of the preformed wire rope has distinctly raised the level of wire rope service in many applications. Rope lives have been increased, rope costs reduced by the practical operating advantages that preforming brought with it.

In choosing the right ropes for your equipment, it will pay you to consult the manufacturer of the equipment you are using, and also the engineers of the wire rope manufacturer. By taking expert advice in the selection of wire ropes, you can save yourself time, trouble and money.

And once you have selected the proper ropes, remember that the service they give you will depend largely on the treatment you give them. Find out what kind of lubrication they may need. If you are using a shovel with a rope crowd, don't use a crowd out rope until it fails. Too often the failure will come in the middle of a rush job, and will cause an expensive tie-up. Find out the natural life expectancy of your crowd out rope—and change it *before* it reaches the end of its useful life. You can get the rest of the value from the rope by using it as a retract rope, or in some other way. You'll save money in the end.

Remember that only by choosing the right ropes, and treating them right, can you get the most service from them. Both wire rope manufacturers and equipment manufacturers will be glad to give you the benefit of their experience. Make use of it to add to your profits.



EXCAVATING ENGINEER

A Monthly Publication
Devoted to the Excavating Industry

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Organize Against Diversion

The need for continued anti-diversion effort was emphasized by the recent action of the New York State Constitutional Convention in voting down a proposed constitutional amendment which would have guaranteed that at least half of the state gas tax revenues could not be diverted from highway uses.

This reverse, and the continuation of diversion in many states makes it evident that the progress which has been made against diversion is not enough. Not only will continued effort be necessary, but that effort must be organized. The public is becoming increasingly aware of the evils of diversion, but the new sentiment must be crystalized and given direction.

You can help do this in your city, county and state. Work out a definite program of needed street and highway construction and modernization. Be sure the program is sound, and is based on a long-term view. Then get civic and county and state organizations interested in it. A good example is the 7-point program the Milwaukee Motor Club is advocating—and advertising in local papers.

The "points" in your program may be quite different; they should fit your local needs, but stopping diversion should be a feature of all programs. And once your program is set, sell it to all the local organizations you can; not merely to groups which may be prejudiced in favor of highway building. Rotary and Kiwanis Clubs, Women's clubs, farmers' associations — practically every local organization has an interest in streets and highways, and their adequacy and safety.

"Sell" these groups your program. You, as road-builders, and they as road-users and tax-payers, are bound to benefit from a definite constructive street and highway plan.

Do You Want Copies of "Building a Business"?

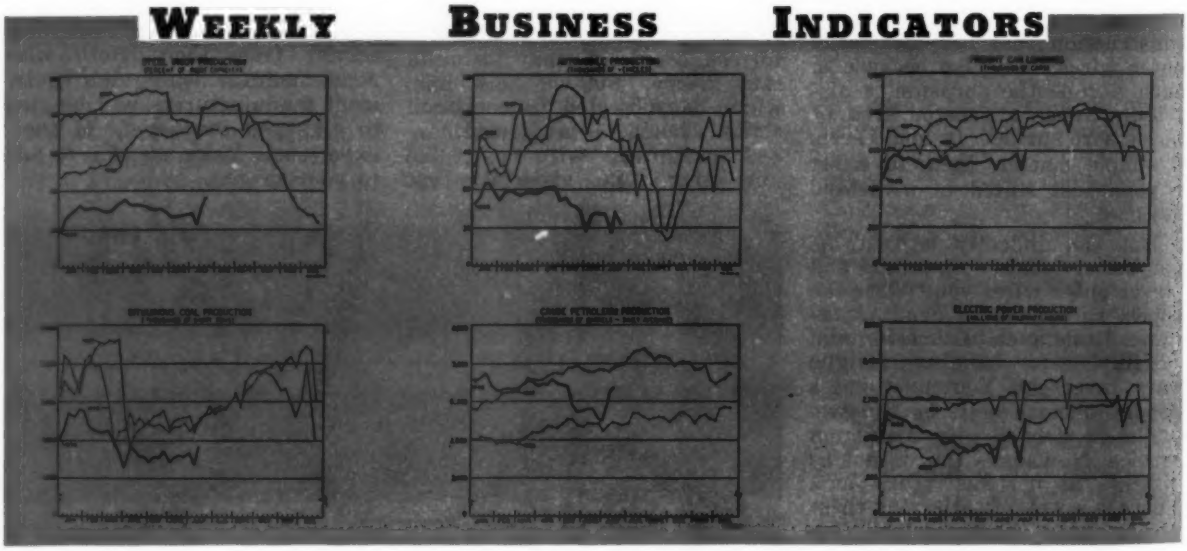
Attractive reprints of the article on the following page are available to you for one cent each. This article is the second in a series adapted from business bulletins issued by the S. D. Warren Company to its employees. These bulletins explain the American business system simply and clearly. They are so well done that Excavating Engineer felt you might like reprints to distribute to your employees.

The first article—"Who Are Business Men?"—was published in the August Excavating Engineer. Reprints of this, as well as "Building A Business" are available to you at our cost price of one cent each. Ten copies of any one reprint is the smallest number we can send to any one person.

Other articles adapted from the Warren Bulletins will be published every month in Excavating Engineer. "When A Business Grows," "Who Puts Up the Money to Run a Business?" "Who Owns Business," and "Should Business Be Big or Little" are some of the articles to come. A total of 12 will be published. If you want reprints of the entire series to distribute to your employees, we will be glad to reserve any number you want, and send them to you when published.

Address your requests for reprints to Excavating Engineer, South Milwaukee, Wisconsin. Tell us the title of the reprint you want, how many you need, and enclose check or money order to cover the cost at one cent per reprint in minimum lots of 10. If you want to subscribe for the entire service, you can figure the cost by multiplying the number of reprints you want of each article by 12. Send us check or money order covering the total at one cent each.

WEEKLY BUSINESS INDICATORS



Building A Business

A MAN WHO drives a truck on an excavating job has certain definite tasks. He must get from shovel to dump rapidly. He must spot his truck under the shovel accurately and so as to avoid lost time. He must handle it so there is a minimum of wear and tear on the truck. He may have to see that the truck gets gas, oil and grease when it needs them. He may be required to report needed repairs and make minor ones himself.

When this man buys a truck to go into the hauling or contracting business for himself, he must continue to look after all these tasks and he must take on others as well. He must hire mechanics to make major repairs in his own shop or pay a garage to have them made. While he may run his business from his home, in one way or another, he still must pay for his equipment, office and garage through rental or ownership. He also must pay for their upkeep and provide for insurance and depreciation. He must take on the job of finding customers who will do business with him and keep his trucks busy throughout the year. He must persuade his customers to pay a fair price; he must collect the bills. And he must be responsible for injuries to himself and any men he may hire to help him and for damage done by his trucks.

If the truckman hasn't the ability to do all of these things reasonably well, he will get less money from his own business than he got when he worked for somebody else and may, in the end, lose his truck and all of his savings. As a business man he must assume certain risks and responsibilities that he never took before (formerly his employer assumed those risks and responsibilities and protected him against them). If he can't fulfill his responsibilities, he will lose his business, his savings and his job all at once.

If the truckman is a good mechanic who can keep his truck rolling with little expense, if he proves to be a good salesman who can get and hold customers; if he can collect his bills and take care of his money; if he can avoid expensive losses due to his liability for damages, he may establish a good business that will earn more money than he earned on his old job. He will be entitled to more money because he will have developed abilities that he never used before, and he will have assumed risks and responsibilities that he never assumed before.

If this truckman's business grows, he will have to hire one or more helpers. If the helpers make mistakes which anger customers or cause damage to trucks or delays on the job, that's the owner's tough luck. It's his job to plan the work for his helpers, and to teach them how to handle the trucks on the job. If he lacks the ability to work with men and to plan for them and teach them, he will never be able to build an important business. He will be forced to be content with a small business, or, as is more likely, he may fail utterly.

Employee

Many businessmen fail when they take on assistants. That's a danger point in the development of any business. Many men are able to run a business, while they do all of the work, but are unable to work with other men, are unable to "reach" assistants or to plan for them. When these men try to expand their businesses, they are likely to go broke.

Furthermore, when a man hires other people in an effort to expand his business, he puts his own character to a test because the processes of expansion will expose his weaknesses and penalize him for them. He may have gotten away with some tricks when he was employed by somebody else, he may have been able to cheat some of the customers that helped him start his own business, but if he is a tricky fellow his tricks are more likely to catch up with him when he hires assistants to expand his business.

A man can be unfair with his employer and yet hold his job because the employer will merely watch him more closely and peg him in a job where his unfairness will harm nobody. A man who operates a one-man business may be able to trim some of his customers and replace them with new ones when he loses them. This becomes harder to do as his business gets bigger and better known. Also assistants who have the ability and initiative to help him will not stay with him long in a shady business. He will end up with incompetent help who will make many errors which will add to his expense and drive away his trade. Eventually he will fail or go back to his one-man business.

Many business men fail when they try to grow beyond their one-man businesses, because they lack the character that business requires of men. Usually these men blame everybody but themselves. They seldom understand the simple fundamental fact that a man who cheats his business assistants is destroying the vitality of his business and thereby cheating himself. They do not realize that their unfair practices were merely a form of business suicide.

If the truckman has the integrity to survive the test that comes when he hires assistants, he will be past his first major hurdle and on the way toward a sound business. He will probably make some mistakes in choosing his men and will have to correct these mistakes, but eventually he can build an organization of people of integrity who respect and trust him and who respect and trust each other. Such an organization is necessary if the business is to be permanent. And it is the best insurance that the business *will be* permanent. Businesses not founded on integrity are short-lived.

Business Man

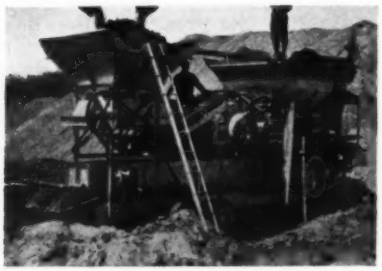
Reprints for distribution to your employees are available.
Page 468 tells you how to get them.

Equipment

you ought to KNOW ABOUT

Stabilizer Plant

The new Cedar Rapids Stabilizer Plant for mixing clay-soils, aggregates, calcium chloride, salt, etc., has been announced by the Iowa Manufacturing Company of



Cedar Rapids, Iowa. Manufacturers claim this new plant, with its many distinct features, is adaptable to all general operating conditions and performs with efficiency and economy. Features claimed for the Cedar Rapids Stabilizer plant are: positive non-clogging clay-soil feeder — accurate proportioning devices — low operating height — a self contained, highly portable unit — large capacity and low operating costs. The entire plant is operated from one power unit which can be either gas or Diesel, at the option of the purchaser.

Automatic Brake

A new safety device for automotive vehicles is now on the market by the Automotive Parts Division, Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, Missouri. Named NoRoL, it is a device which keeps a truck or car from rolling backwards when a stop is made on an incline or hill. It acts automatically—holding the brakes "set" until the car is started forward.

In bringing a NoRoL equipped vehicle to a stop, the driver simply applies the brake and disengages the clutch in the conventional manner. An automatic check retains the hydraulic pressure in the braking system—and this pressure holds the brakes "set" as long as the clutch pedal is depressed. This feature enables the driver to take his "brake foot" off the brake pedal and have it free to operate the accelerator.

It can be installed on all 1937 and 1938 hydraulic brake equipped cars, and most makes of trucks, buses and trailers.

Four Wheel Drive Truck

With the announcement of the new models CU and CUA, with rated capacities of 3 to 4 tons and gross vehicle weights of 20,000 lbs., a complete, improved line of FWD four-wheel drive trucks is now available for every hauling requirement, in sizes ranging from 13,000 lbs. gross to 15 tons capacity. Designed to give maxi-

mum performance, and having new styling, the Models CU and CUA incorporate the basic principles adhered to by The Four Wheel Drive Auto Company for 28 consecutive years of manufacturing.

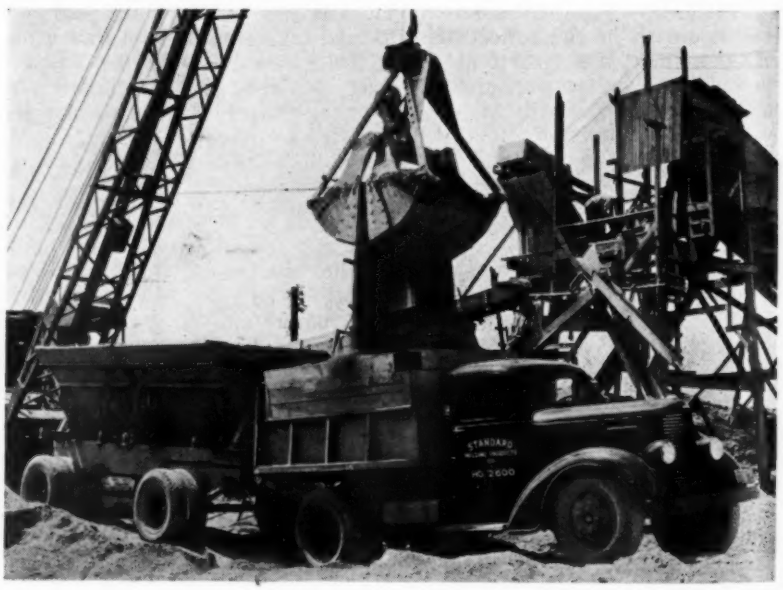
Developing 96 BHP, and 280 lbs. ft. of torque, these two FWD models are designed for mounting a wide variety of auxiliary equipment and bodies. Briefly, other specifications are: 5 speed transmission; a midship sliding jaw clutch type on the CU and a sliding gear unit type on the CUA; 14″ single plate clutch; gear ratios of 7.31:1 standard, and 6.72:1 and 8.84:1 optional; single reduction, bevel gear type, full floating axles, with split type housing, both front and rear; 9.75 x 20 tires, singles front and rear, duals optional at extra cost; 71″ tread; 150″ wheelbase, standard.

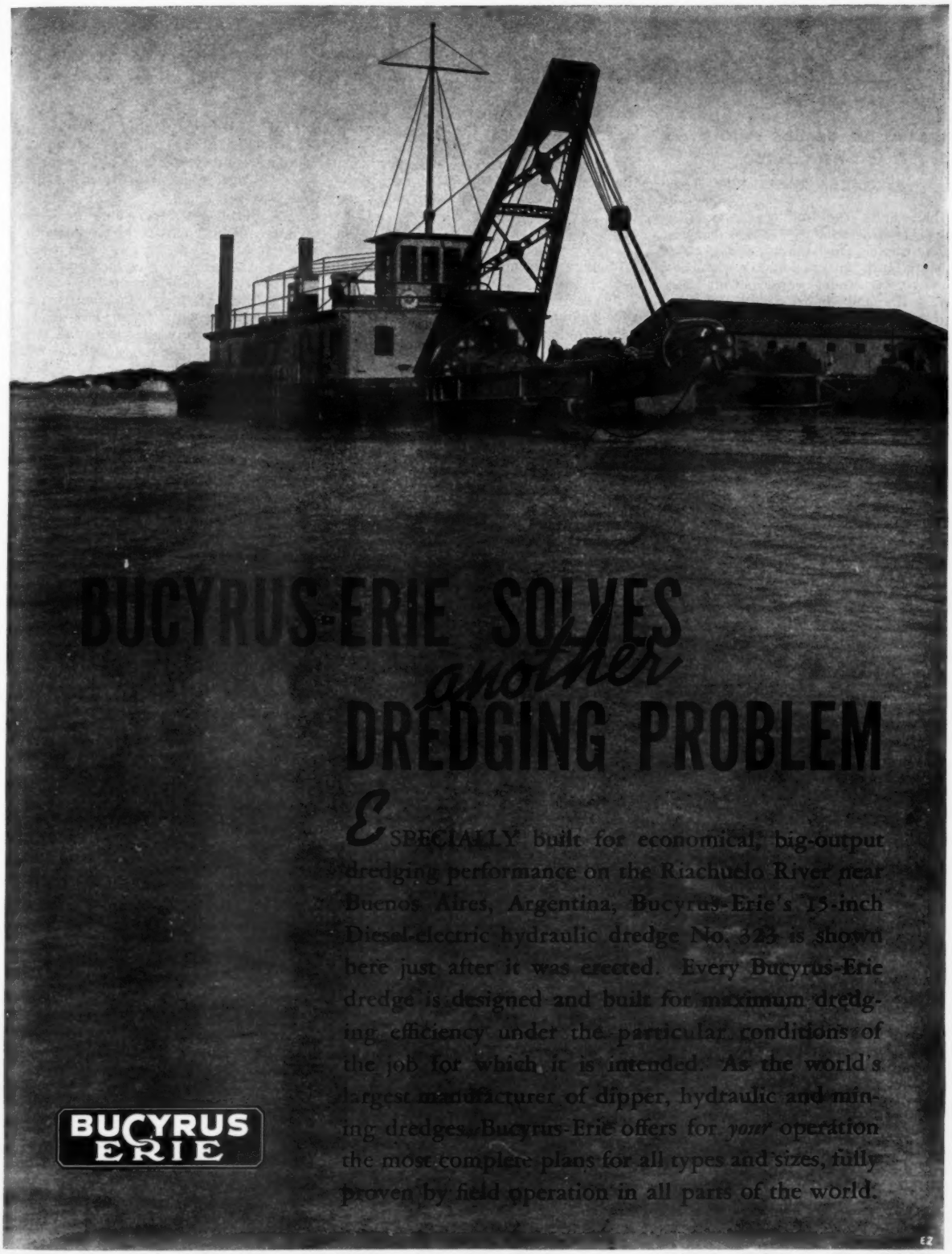
Truck Performance

Road tests are numerous in the automobile industry but few compare with the tasks to which the Standard Building Products Company of Detroit daily subjects its fleet of Dodge trucks during all seasons of the year.

According to J. T. Clark, secretary and treasurer, each piece of equipment, three 2-ton and five 1½-ton, carrying loads of sand, gravel and cement blocks aver-

(Continued on page 484)

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For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

Shots from the FIRING LINE

Excavation Begins Again At Grand Coulee

By GRACE KIRKPATRICK

Once more the bulldozers, tractors, power shovels and trucks are busy at Grand Coulee. Once more a gravel plant is being built, and once more a giant belt conveyor is under construction. This makes it sound almost as if everything had gone backward and as if the great project were being started all over again.

Of course, such is not the case, but a new cycle in the building of the world's largest dam is getting underway and will gain fast momentum now that word has come through from Washington, D. C., that $26,005,000 will be available throughout the coming fiscal year for Grand Coulee.

About the first of the year, the Mason-Walsh-Atkinson-Kier company completed its contract and on March 21, the Consolidated Builders, Inc., were notified by the Bureau of Reclamation to proceed with work. The contract of the Consolidated Builders calls for completion of the dam to its full height of 550 feet, and length of 4300 feet. It will include construction of the pumping plant along the west abutment and of the west power house, with three of its nine main generating units and two station service units.

CBI, the combination of initials that in the wake of MWAK, signify the general contractors, must remove about 800,000 cubic yards of rock. Most of this is near the west end of the dam and around the pumping plant foundations. Rock men, who are so brown they might be Indians, who not a great many years ago, inhabited this great Columbia River valley, are now at work. Held together by ropes, they operated the compressed air drills up the face of the granite walls. Big shovels are also busy in some locations.

On the east side, rock excavations for the abutments are virtually completed to the top of the dam. At each end of the crest recesses are being carved out of the solid rock where the big cranes will be permanently stationed, to be run out over the crest of the dam when needed in the operation of equipment.

According to the "Columbian," mimeographed safety house organ of the contractors—

"By far the largest single-belt conveyor system in the world will soon be under construction as 2500 feet of 42-inch belting is scheduled as the first section installed.

"The endless belt will extend nearly one mile from the gravel plant to the airplane tripper over the stock piles. It will contain approximately 10,000 feet of belt. The previous record for single-belt conveyor is believed held at O'Shaughnessy dam in California with 3,300 feet of belt.

"The new system here will eliminate the five sections of belting, each propelled by a 200 horsepower motor, as used by the previous contractor. Conveyor cleanup also will be facilitated by the change, and water jets at the discharge end will clean the belt for its return trip.

"Excavation is well along for foundation timbering.

"Stripping of approximately 100,000 yards from the face of Brett pit has largely completed excavation preliminary to aggregate production later in the year. This constitutes only about 20 per cent of the estimated amount to be stripped during concrete production.

"Stripping has been for a cut from 150 to 200 feet deep, with the bottom at elevation 1600, over 300 feet higher than Mason City.

"The task of tunneling far back into darkness of the east keyway ended recently at 643 feet—over two city blocks. Within a week trimming of the 5 by 7-foot tunnel probably will be completed.

"The rock gallery is for inspection, drainage and grouting. Grout (cement-water) will be forced under pressure through drill holes in the tunnel to seal all crevices, however minute."

CBI is also completely rebuilding the $1,500,000 gravel plant—which they call the aggregate plant. This has been done to get the latest and most modern machinery.

The Bethlehem Steel company, under a sub-contract, has under construction what is at present the most spectacular job at the project—the building of a bridge bigger than any in the state of Washington, the new construction trestle. It is being built from both sides of the river at once and is expected to be finished by October 1. It will be 3600 feet long, 180 to 205 feet above the present concrete work, and 42 feet wide. Four standard gauge railroad tracks, as well as the tracks for the moving cranes, will be laid across it. As the concrete for the dam rises, the 12,500 ton of steel in this huge trestle will be embedded in it.

According to Frank A. Banks, United State Bureau of Reclamation engineer in charge of construction at Grand Coulee, another important project that must be undertaken soon is the clearing of the river banks, and adjacent land that will be submerged by the big lake that will fill in 150 miles behind the dam to the Canadian border. This huge body of water, which will have a maximum depth of 355 feet, will extend six to eight miles up the San Poil river, five or six miles up the Kettle River, and up to Little Falls on to the Spokane, is beginning to grip the fancy of the people of the northwest.

Already two companies have requested certificates of necessity and convenience to operate passenger and freight

● This view shows Grand Coulee Dam as CBI takes over construction. Coffer dams have been removed and the Columbia is flowing through and over the center section of the dam.

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DIESEL ENGINE LUBRICATING OIL

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On construction jobs, in power plants, in the woods and on the farm, "RPM" Diesel Engine Lubricating Oil is helping Diesel tractor owners to earn more profits.

It is made to prevent ring-sticking, reduce non-operating hours and end overhauls for carbon removal. When drained it removes dirt and carbon which it holds in suspension.

If your equipment is "Caterpillar" Diesel, this is *your* oil. "RPM" Diesel Engine Lubricating Oil is distributed by the following companies under the brand names indicated:

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STANDARD OIL COMPANY (Inc. in Kentucky)
STANDARD OIL COMPANY (Nebraska)
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STANDARD OIL COMPANY OF TEXAS
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THE STANDARD OIL COMPANY (Ohio)

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Get in touch with your nearest distributor—for a clean engine, and long hard service with the minimum of overhaul.

WORLD-WIDE ACCEPTANCE

boats when the stored up waters will fill the lake.

Work of the CBI, which to date has been largely preliminary and in preparation, is on schedule and in view of the allotment of new funds work will proceed at full speed.

Levee Letting to Include 5 Million Yards

Bids will be opened September 13th at the United States Engineer Office—Second New Orleans District—at the foot of Prytania Street, New Orleans, for approximately 5,000,000 cubic yards of earthwork on the Upper Guide Levee of the Morganza Floodway.

Followng is a general description of the work planned:

Item	Estimated total net cu. yds.	Net height feet
MU-B	1,220,000	21-25
MU-C	1,220,000	21-25
MU-D	1,220,000	21-27
MU-E	1,220,000	22-26

The site of the work is located in Pointe Coupee Parish, La., and extends from a point about 3 miles south of the town of Batchelor, La., in a general southwesterly direction a distance of about 9 miles to a junction with the east bank Atchafalaya River levee about 2 miles north of the Texas & Pacific Railroad bridge at Melville, La. The site of the work may be reached by automobile from Baton Rouge, La., by way of U. S. Highway No. 190 and State Highways Nos. 93 and 30 to near the upper end of the work, and by way of U. S. Highway No. 190 and State Highways Nos. 1 and 41 to near the lower end of the work. Local roads and trails provide access to frequent points along the length of the work. The work is staked out on the ground.

Bidders will be required to specify in their proposals the equipment proposed to be used, together with the present location of same, and the plans proposed to be used in the construction of the work.

The specifications list the minimum wage rates, approved by the Department of Labor, which will be applicable to this work in accordance with the provisions of Public Act No. 403, 74th Congress, approved August 30, 1935.

The contractor will be required to employ as many qualified persons as possible from the relief rolls.

The contracts must be completed by December 31, 1939, but an emergency protection embankment involving approximately 500,000 net cubic yards in each item shall be completed by March 31.

Lt. Col. William F. Tompkins is District Engineer in charge.

Vicksburg District to Place 7,186,000 Cu. Yds. in Levees This Year

The flood control construction program for the current fiscal year in the Vicksburg District was recently released by Lt. Col. Raymond G. Moses, District Engineer, Vicksburg, Mississippi, according to a bulletin of the Mississippi Valley Flood Control Association.

The program includes the placement of 7,186,000 cubic yards of earthwork in levees, plus the rental of equipment for additional levee construction, plus the building of the Sardis Dam spillway and the Sardis Dam upstream slope protection. The detailed program is as follows:

Mississippi River Levees

In Mississippi

Item	Estimated Yardage (Approximate) Cu. Yds.	Estimate date of opening bids 1938
Waxhaw Landside Berm	70,000	September
Bolivar Bluehole Fill	170,000	September
Black Bayou Landside Berm	650,000	September
Above Greenville Landside Berm	175,000	October
Below Greenville Landside Berm	300,000	October
Longwood Landside Berm	150,000	October
Leota Setback	320,000	October

In Louisiana

Willow Point Setback	1,825,000	October
Elton Slough Berm Extension	55,000	September

Fuse Plug in Arkansas

Lucca Landing-Arkansas City Enlargement	240,000	September
Little Boggy Bayou Levee Enlargement	330,000	September
Luna to Vaucluse Enlargement and New Levee	1,600,000	October

Ouachita River in Louisiana

Lake Lafitta Levee	125,000	September
Blankston to Indian Mound Levee	450,000	September

Red River in Louisiana

Saline Point Cut-Off	626,000	October
Saline Point Levee	36,000	October
Below Natchitoches Dam	64,000	December
Below Natchitoches Flood Gate		December

Yazoo River

Sardis Dam Spillway	September
Sardis Dam Upstream Slope Protection	October

Equipment to Be Leased

Item and Type of Equipment	Estimated date of opening bids 1938
For Big Black River in Mississippi—Draglines and Tractors	September
For Colfax Cut-off in Louisiana—Tractors and Wagons and Draglines	September
For Natchitoches Levee, in Louisiana—Draglines	October

Recent P.W.A. Allotments

Forty-five power projects with a total estimated cost of $28,328,000 have been put on the presidentially approved list for P.W.A. allotments. Twenty-four of these projects do not compete with privately owned power companies, and allotments to the remainder have been made conditional to the failure, after reasonable efforts, to acquire the competing private utility on reasonable terms and conditions.

Some of the large recent P.W.A. allotments include: $10,750,000 for construction of four Bonneville power transmission lines; $7,350,000 (of which $2,850,000 is a grant) to the lower Colorado River Authority project near Austin, Texas; a $4,500,000 grant for the Santee-Cooper power project in South Carolina; $4,795,000 for a section of the East River Drive express highway in New York City; $1,250,000 to the Bureau of Reclamation for widening of Marshall Ford Dam to make it suitable as the foundation for a future high dam.

For your convenience in writing to Standard Oil Co. of California, you will find a card bound in this issue.

Charles Nelson Ballentine

C. N. Ballentine, Southern Sales Manager for Bucyrus-Erie Company, died from a heart attack in Lakeland, Florida, on July 23. He had been in ill health for about a year.

"Bal", as he was known throughout the excavating industry, was born on July 16, 1886. He was graduated from the University of Michigan in 1910, and began work in the drawing room at Bucyrus-Erie's South Milwaukee plant September 6, 1910. Shortly thereafter, he took the company's special apprentice training course, working in the field erection department after completion of this special training.

During the war, he was a first lieutenant with the 107th Engineers in France, subsequently becoming a Captain. After serving in Fort Sheridan, Camp Custer and Waco, Texas, his outfit sailed to France on the ill-fated

Tuscania. It is typical of "Bal" that he was one of the last to leave the ship after it was torpedoed off the Irish coast.

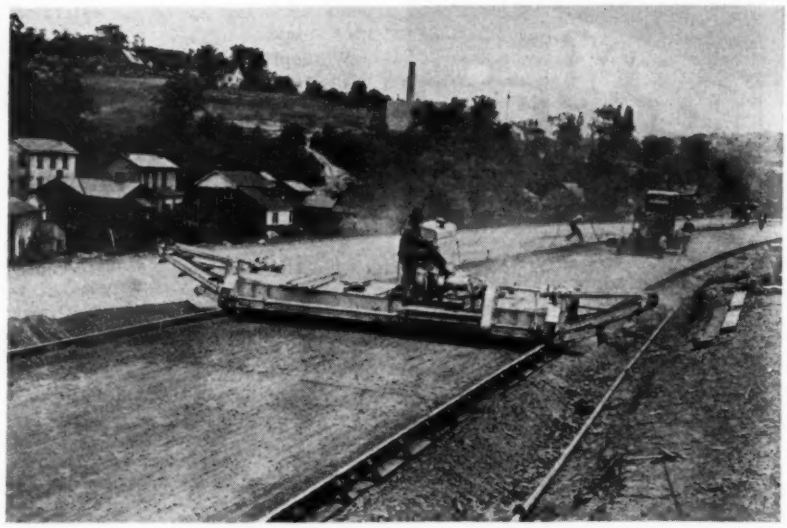
Following the war, he returned to Bucyrus-Erie, being appointed Southern Sales Manager in February, 1919. Since that time, his headquarters have nominally been in Birmingham, Alabama. His actual "headquarters" for nearly 20 years, however, have been all over his territory. "Bal's" personality was one which made him friends quickly, his unswerving honesty and square shooting kept those friends, once made, throughout his life.

His death brings deep sorrow to his co-workers and to the countless friends he made during his service to the excavating industry. His place in the industry will be difficult to fill; his place in the affection of his friends can never be filled.

"Bal" never married. He is survived by a brother, James M. Ballentine of Glencoe, Illinois.

New Pennsylvania Super-Highway

A modern $1,000,000 traffic artery, now under construction, will further connect downtown Pittsburgh to one of the fastest growing suburban districts in Western Pennsylvania. This is the new Banksville Road, which will permit two lanes of traffic in each direction, and provide an alternate route to and from the South Hills communities of Mt. Lebanon, Dormont, and Beechview, thereby lessening the rush hour traffic passing through the Liberty Tubes tunnelled through Mt. Washington.



• Setting subgrade to accurate elevation and cross-section on the new Banksville Road is handled with this Blaw-Knox Surgrader.

Booth & Flynn, local contractors, are placing the three miles of concrete pavement in two lanes, each 20 feet wide and separated by a four foot island strip. Because of a meandering stream in the locality, it was necessary to construct nine concrete box culverts each about eight feet above the stream bed. All culvert pipes are triple strength vitrified clay because of the stream's high acid content. These culverts constitute about 3,250 feet in overall length, and represent about 40 per cent of the contract price.

Additional construction problems resulted from the fact that the highway is being laid over an old single line railroad bed along the route, and that an unusual amount of unsuitable base material was encountered, necessitating the hauling of quantities of clay or shale to the site.

After primary excavation, filling, and leveling, road forms are being laid and a Blaw-Knox Surgrader is used to set

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the subgrade to accurate elevation and cross-section. A bulk cement batching plant having a 60 ton capacity receives bulk cement by the carload and batches it into trucks using a recently developed type of cement bag. Crushed limestone aggregates are used and are batched and loaded into the trucks at a McCrady-Rodgers Company plant. A fleet of about 20 two-batch trucks are used and are hauling on the average of 30 loads an hour. Batched cement and aggregates are discharged into a paving mixer, dumped between the forms, and leveled and surfaced by a Blaw-Knox Gas Electric Finishing machine.

Wood post woven wire guard rails are being installed wherever needed, and every precaution is being taken to insure the safety of the motorists.

Shasta Employment Warning Issued

"Do NOT go to the site of Shasta Dam or to Redding in the hope of getting work on the Central Valley Project!"

This warning has been repeatedly given by Walker R. Young, construction engineer for the United States Bureau of Reclamation, in the face of reports that a continuing influx of unemployed persons to Shasta County, far in excess of the number of workers needed for early dam construction, has created a critical relief problem in the area.

In response to inquiries from many sources, Mr. Young issued a statement of the employment situation and practices on the Central Valley Project, particularly as applied to the Shasta Dam job for which employment regulations are slightly different than those prevailing on preliminary project work.

"All construction started to date, including that on the diversion tunnel at the Shasta Dam site, has been financed with emergency relief funds, and the contracts provide preference in employment for residents of California and for persons on relief rolls. Such contracts require that mechanics and laborers be secured by the contractors through the California State Employment Service which has offices in every county seat.

"The Shasta Dam job, however, is to be financed with regular funds specifically appropriated by Congress, and requires therefore the standard Government form of construction contract. This form of contract contains no such employment restrictions as in the emergency relief form of contract.

"All labor for Shasta Dam construction will be hired directly by the contractor from whatever source the contractor sees fit, although it may be that the facilities of the California State Employment Service will continue to be used."

Mr. Young urged that those desiring employment on Shasta Dam, or any other unit of the Central Valley Project, continue the established practice of registering at their respective county employment offices where they may be kept advised of labor requirements cleared through the California State Employment Service.

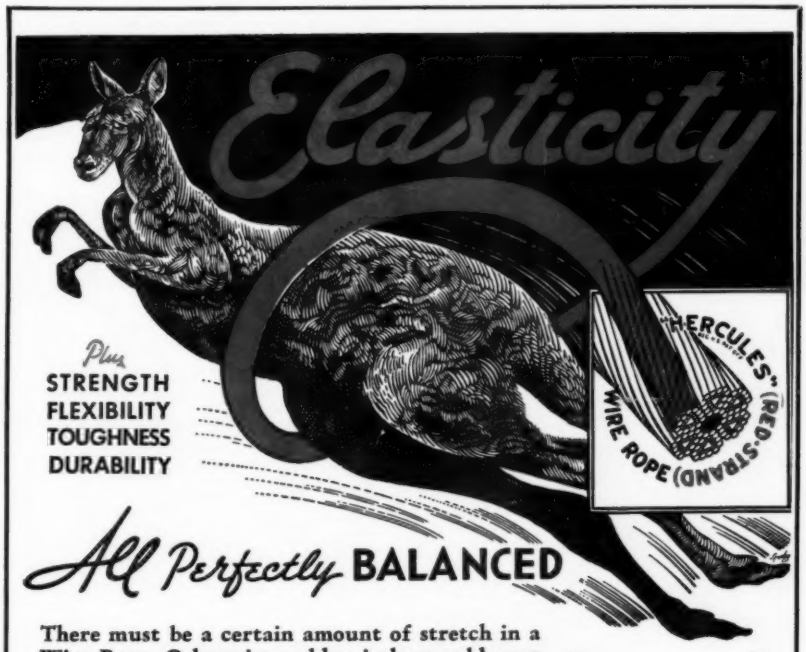
"Don't go to the scene of construction in the hope of getting work," he advised job seekers, "because there is nothing to be gained thereby. Inquire at your home office of the California State Employment Service."

A contract for construction of Shasta Dam and power plant has been awarded to the Pacific Constructors, Inc., of 609 South Grand Avenue, Los Angeles, on a low bid of $35,939,450. This company will be required to start work within 30 days after it receives an official notice from the Government to proceed with construction.

The time of large-scale employment, however, will not be reached until several months after the start of work on the dam, and the time of peak employment probably will not be reached for at least two years.

Labor regulations in the Shasta Dam contract include a schedule of minimum rates of wages as determined by the United States Department of Labor, a provision for maximum working hours of eight per day and 40 per week, and a prohibition against the use of convict labor or Mongolian labor. There is no legal authorization, under the standard form of contract, for stipulating a local labor preference.

The Government rolls, small com-



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pared to the contractors' forces, consist principally of engineering, clerical and inspection employes. Appointment of engineers, inspectors, chiefs of field parties and clerks required by the Bureau of Reclamation is made by the Secretary of the Interior, Washington, D. C. Appointment of instrumentmen, transitmen, levelmen, rodmen and chainmen for the Bureau of Reclamation is made by the Construction Engineer, Sacramento, California.

Change Bituminous Conference Dates

Dates for the 1938 National Bituminous Conference have been changed to October 10 to 13. The meeting will be held at the Edgewater Gulf Hotel, midway between Biloxi and Gulfport, Mississippi. The hotel is served by U. S. Highway 90, and by the Illinois Central and Louisville and Nashville railroads.

The program will consist of four sections: 1—Progress in Research as Related to Construction and Maintenance of Bituminous Surfaces, 2—Fundamentals of Bituminous Construction, 3—Construction of Bituminous Surfaces, and 4—Maintenance of Bituminous Surfaces.

Hosts for the conference are the State of Mississippi, and the Mississippi State Highway Department.

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$31,000,000 Flood Control Funds Reallocated

Having learned definitely that $6,000,000 which Senator Overton had included in the last deficiency bill for expenditure on the Morganza floodway and fuse plug levees cannot be made available, Maj. Gen. Julian L. Schley, Chief of Engineers, has reallocated $31,000,000 of regular funds for various flood control projects in the Memphis, Vicksburg and New Orleans Engineer Districts.

The reallocation of funds will enable Army Engineers to start promptly a fairly large program of construction work in the lower valley. Three large projects that have been authorized since 1936 will get under way at last—the Morganza floodway which recently was divorced from the Eudora, and the St. Francis and White River projects which have been held up while rights-of-way and easements were being acquired. These projects can be pushed to completion as rapidly as funds are made available.

In addition to these long delayed projects, funds were provided for dredging, revetments, strengthening of main line levees, continued work on the Sardis Reservoir, the beginning of work on the Arkabutla reservoir in Mississippi, the completion of the Wax Lake and Charenton outlets, and the raising and strengthening of the Boeuf and Pointe Coupee fuse plug levees.

Allocations approved by General Schley are as follows:

Main River:	
Dredging	$ 6,175,000
Revetments	2,300,000
Levees	4,900,000
St. Francis River project	2,300,000
White River backwater project	1,500,000
Eudora Floodway	100,000
Yazoo River projects:	
Sardis Reservoir	4,600,000
Arkabutla Reservoir	75,000
Morganza Floodway	4,000,000
Bridges, Atchafalaya River	150,000
Wax Lake and Charenton Outlets	3,000,000
Surveys, Gages and Observations	750,000
Levees (Section 6)	300,000
Mapping	100,000
Boeuf and Pointe Coupee Fuse Plugs	750,000
	$31,000,000

It is pointed out that $750,000 need not be the limit of money expended on raising and strengthening of fuse plug levees. As much as may be desired can be taken from the $4,900,000 item of levees and used on the fuse plugs.

President Roosevelt has asked the Army Engineers to place as much work as possible under contract within 60 days.

Black Canyon Canal Award to Terteling

J. A. Terteling and Sons of Boise, Idaho, on their bid of $239,406.50, have been awarded the contract for excavation of over 5 miles of the Black Canyon canal.

This bid was the lowest of 5 received and opened by the Bureau of Reclamation. The contract involves the excavation of approximately 1,278,500 cubic yards of earth and 25,000 yards of rock. It covers also construction of miscellaneous structures along the route of the

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The new 6 and 8-Yard Units are similar in operating principle to the popular job-proved A-W 5-Yard Scraper. A single cable and winch, operated from the tractor, controls every operation . . . reducing maintenance expense . . . simplifying operation . . . speeding up digging and dumping time on every trip.

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Austin-Western

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● J. A. Caesar's ⅜-yard shovel is shown digging a 200-yard basement for a demonstration home in Topeka, Kansas. The job took exactly four hours—a record in Topeka, and perhaps for the rest of the country.

canal including bridges, culverts, tunnel transitions, checks, and turnouts.

The work is located immediately southwest of Emmett.

The contractor will be required to begin work within 30 days after notice to proceed has been issued and is allowed 240 days in which to complete the job.

Speedy Basement Job

By PAUL MONTGOMERY

Excavating a 32 x 24 x 7-foot basement in four hours with his ⅜-yard shovel, contractor Joe Caesar recently hung up what they believe in Topeka, Kansas, is a record. Whether other ⅜-yard owners have made equal or better yardages on similar jobs, we do not know, but at any rate Mr. Caesar's accomplishment is one to be proud of.

The basement on which the record was made was excavated for a demonstration home being featured by the "Topeka Daily Capital." With two operators spelling each other, the Bucyrus-Erie 10-B was kept going at top speed throughout the four hours. About half the dirt was loaded to a dump truck, and half was dumped directly where needed on the site.

The shovel was brought to this job on its trailer from another job one-half mile away, The move, including unloading the machine and getting it in position for the first bite, took 20 minutes. Within 15 minutes after completion of the basement the 10-B was back on the trailer and on the way to another job.

Advertising plays a part in getting Joe Caeser enough jobs to keep his ⅜-yard rig busy. He advertises one-day service in basement excavation in the newspaper, and usually does the job in less. The combination of the ability to produce results and to merchandise his services is making 1938 a good basement year for Mr. Caesar.

Hallett Low on Wappapello Dam

Hallett Construction Company, Crosby, Minnesota, was low bidder for con-

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rucks are affected by weather conditions, par-cularly at the dump. Athey Forged-Trak railers work regardless of bad weather. Their wheels are non-iring—they can operate efficiently on slippery, bumpy, rutted uneven surfaces.

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Trucks are subject to interruptions through tire failure—but you don't pay high tire replacement and repair cost when you use Athey Forged-Trak Trailers. In addition, these trailers have the frame and body strengths which trucks cannot provide.

ET RID OF HIGH MAINTENANCE • •

g loads, washboard roads and slippage play vroc with truck tires, frames and bodies. You ed never pay such high maintenance costs with Athey Forged-ak Trailers.

YOU PAY NO PENALTY FOR BIG LOADS

Tires are built to carry a given load at a specified inflation—either overloading or under-inflation immediately imposes a penalty of shorter life. Athey Forged-Trak Trailers *absorb* the overload caused by road inequalities and loading impacts.

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struction of a flood control dam and appurtenant works in the vicinity of Wappapello, Missouri. Lowest of 11 bids received, the Hallett bid totalled $1,883,-469.46. Second low bid, submitted by R. J. Reid Contracting Company of Birmingham, Alabama, was $2,283,163.00.

Quantities and unit prices offered by the Hallett Company on major items are as follows:

Designation	Quantity	Unit	Unit Price
Clearing: Dam Site	50	Acre	$120.00
Grubbing: Dam Site	50	Acre	184.00
Clearing: Spillway and Control Structure	75	Acre	91.00
Stripping: Dam Site	242,000	Cu. Yds.	.23
Excavation: Common	2,255,000	Cu. Yds.	.23
Excavation: Common; Diversion Channel	92,000	Cu. Yds.	.14
Excavation: Rock	200,000	Cu. Yds.	.52
Rock Channeling	30,000	Sq. Ft.	.50
Fill: Common	195,000	Cu. Yds.	.04
Backfill: Compacted	105,000	Cu. Yds.	.09
Fill: Common, Diversion Dikes	90,000	Cu. Yds.	.04
Fill: Compacted, Earth Fill	1,700,000	Cu. Yds.	.05
Fill: Compacted, River Channel	250,000	Cu. Yds.	.10
Fill: Compacted, Dikes 1, 2 & 3	41,000	Cu. Yds.	.06
Sand & Gravel Filter	103,500	Cu. Yds.	1.55
Riprap: Dumped	223,000	Cu. Yds.	.10
Riprap: Hand Placed	8,500	Cu. Yds.	.70
Steel: Reinforcing	1,950,000	Pound	.045

New Flood Control Allotments

The Secretary of War has approved the following allotments from the War Department Civil Appropriation Act for 1939, for initiation of work on Flood Control Projects:

Project	Amount
York, Pa., Codorus Creek	$ 550,000
Plymouth, Pa., Susquehanna River	683,000
Williamsport, Pa., Susquehanna River	200,000
Harrisonville and Ivy Landing Drainage and Levee District, Ill.	200,000
North Alexander County Drainage and Levee District, Ill.	271,000
Degognia and Fountain Bluff Drainage and Levee District, Ill.	225,000
Lacey, Langellier, West Matanzas and Kerton Valley Drainage and Levee District, Ill.	188,400
Banner Special Drainage and Levee District, Ill.	128,700
East Liverpool Drainage and Levee District, Ill.	137,700
Liverpool Drainage and Levee District, Ill.	48,600
Mouth of Sangamon River, Ill.	122,400
Farmers Levee and Drainage District, Ill.	141,000
Near Springfield on Sangamon River, Ill.	90,000
Lussenhaf Levee, Ill.	1,850
Bell and Mertz Levee, Ill.	25,900
Tar Creek Levee, Ill.	34,800
Memphis, Tenn., Wolf River and Nonconnah Creek	2,125,000
Columbia River Basin, Wash. and Oregon:	
Diking and Improvement District No. 4, Wahkiakum County, Wash.	187,000
Scappoose Drainage District, Ore.	206,000
Rainier Drainage District, Ore.	32,000
Penninsular Drainage District No. 2, Multnomah County, Ore.	340,000
Sauvie Island (Areas A and B), Ore.	617,000
Knappa Area, Clatsop County, Ore.	10,000
Karlson Island, Clatsop County, Ore.	44,000
Consolidated Diking and Improvement District No. 1, Cowlitz County, Wash.	233,000
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Youngs River Dikes, Clatsop County Ore.	245,000
Drainage District No. 1, Multnomah County, Ore.	304,000
Willamette River Basin, Oregon:	
McKenzie River, Ore.	80,000
Santiam River, Ore.	180,000
Rocky Ford Drainage and Levee District, Ill.	47,900
Total	$7,809,250

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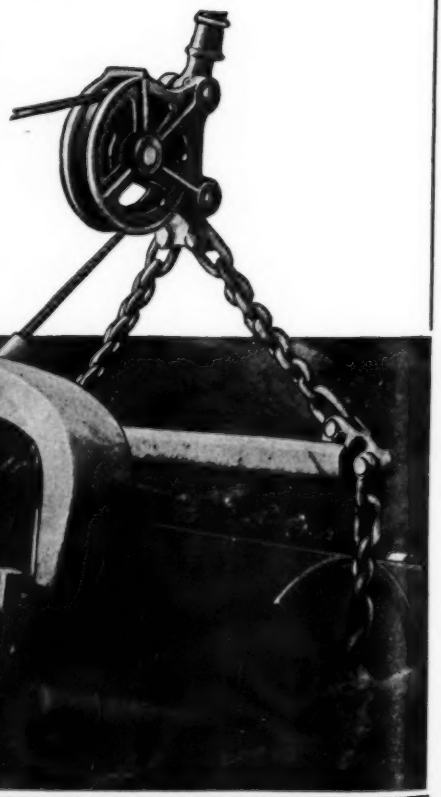

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NOT in the *Contract*

A steam - shovel - owner named
Weller
Is quite a convincing young feller;
His loud exhortations
About excavations
Have made him a swell cellar-
seller.

"I say, Joe, your girl looked quite attractive in that Biblical gown she was wearing last night."

"What do you mean, Biblical gown?"

"Oh, you know. Sort of lo and behold."

Jones was showing his wife and her friend around the new offices. He left them in the reception room while he answered a telephone call, and the conversation between the two women drifted to household matters.

"Have you put up much fruit this year," asked the friend.

"Not very much so far," answered Mrs. Jones, as her gaze wandered to several pretty stenographers, "but I intend to can some peaches very soon."

The latest make-work solution for unemployment that we have heard about is the proposal to form a bucket brigade and transform the Atlantic into the Pacific.

"Hey, Buddy, where did you get that blonde you were with the other night?"

"Dunno, I just opened my billfold and there she was."

A friend noticed Dugald riding along the street on a woman's bicycle. "How came ye by that?" he asked.

"Well, it was like this," said Dugald. "I was walking out with Janet the other evening, and when we came to a darkish part of the moor, she said, 'I love ye, Dugald; I love ye so much I'll give ye anything ye like.' So when I had thought it over a bit I took her bicycle."

"Why is a corset like an ash cart?"

"Because it goes around gathering up the waist."

"Look, Boss, we struck oil!"

Typographical Error Department

"Many of the women spooned and had to be carried from the wreckage."

"The fourth annual banquet of the Boosters' class of the First Reformed Church was hell in the church dining-room Wednesday evening, with 54 attending."

"Four calf shows were held in Pettis county last week, a girl winning first and second prizes in every instance but one."

"I bought a cow that was supposed to have held the county record for blessed events. I have had her now for over a year and nothing has happened."

"Somebody must have given you a bum steer."

"How many seasons are there?" asked the teacher of the contractor's daughter.

"Just two," answered Rachel.

"What are they?" inquired the puzzled instructor.

"Slack and busy," replied Rachel.

Old Angus was noted for his stretching of the truth; so much so that visitors frequently engaged him in controversial subjects in order to trap him into saying something they could catch him up on. But Angus was a canny Scot and it was a hard job. One visitor who knew his propensity for bragging up anything Scottish lead the conversation around to the clearness of the air. "And I suppose," she said, "that you can see as far as ten miles away."

"Further," said Angus.

"Do tell," said the lady, "I don't suppose you can see objects fifty miles away?" "Further," said Angus, "Oh, come now," said the lady, "isn't that stretching it a bit?"

"Well," said Angus, "on a clear nicht we can see the moon."

Equipment You Ought to Know About

(Continued from page 470)

ages better than 280 miles a day. The hauls are made between the Detroit plant and a large gravel pit 20 miles distant.

The company made its switch to Dodge equipment a year ago and reported that although a preliminary analysis indicated a probable 50% reduction in costs, that figure was bettered at the conclusion of 12 months. Whereas hauling the previous year had cost 75c a yard, that figure was reduced to 31c a yard with Dodge trucks.

Arthur Simenton, truck sales manager of Taylors, Inc., Dodge dealers, who figured cost reduction for the company, pointed out that excellent service on equipment has aided Standard Building Products Company in establishing a remarkable record in daily performance.

43-Yard Truck

The world's biggest truck, a 43-yard monster, powered by a V-type, 8-cylinder, 180 horsepower "Caterpillar" Diesel Engine with a torque rating of 102 ft. lbs., has been built by the Trojan Truck Manufacturing Company of Los Angeles, California. On a four mile haul, the truck handles an average of 85 cubic yards of material an hour, and does this work on approximately 3½ gallons of Diesel fuel.

A specially designed tail gate makes it possible to load the unit to its maximum capacity regardless of the type of material being handled. It unloads in 45 seconds by means of a sliding bulkhead in the body that pushes the load out and spreads it simultaneously.

The transmission is a unit power type having three speeds forward and one speed reverse. designed to take the torque and power output of the engine. The truck is a twelve wheel drive with two sets of triple tired wheels in the rear. There are, in all 14 demountable type disc wheels, 24 x 12 inches, having bolt circle diameters of 14½ inches.

P&H Welder

Claiming precious gold from swamps of California depends on a metal equally precious—steel, in the form of electrodes used to repair and maintain broken castings, etc., and to keep this dredging equipment in A-1 operating condition, claim the manufacturers of P&H arc welders.

A P&H-Hansen 150-ampere, stationary gas engine-driven arc welder, owned and operated by the Fourells Dredge Company of Richvale, California, prominent gold dredgers of that district keeps the dragline, which keeps the separating machinery supplied with gold-bearing muck, as well as the separating machinery itself, in good shape. The welder is also used for pointing the dragline bucket teeth and other general repair work. While the dredge itself works 18 hours per day, every day in the week, the welder is required only about 5 hours a week on the average. Its easy starting, its well-regulated current, and its stabilized arc, are valuable assets for this type of work where the expense of a skilled operator is not warranted and where operation is only intermittent.

Lightweight Jackhamer

The Ingersoll-Rand Company announces a new Jackhamer, the JA-35. It is a lightweight drill, styled after the JA-45 and JA-55. It will readily handle all general light Jackhamer work. Manufacturers claim it has that extra power when necessary to handle a job ordinarily done by a heavier machine.

Weighing less than 35 pounds, it is an easy holding, fast drilling machine that finds application in coal and metal mines, in quarries, and on construction jobs.

Descriptive literature on the JA-35, as well as other members of the Jackhamer family is contained in bulletin 2433, copies of which may be obtained from Ingersoll-Rand, 11 Broadway, New York City, or any of their branch offices.

Welding Electrodes

General Electric Company, Schenectady, New York, announces the manufacture of two new electrodes. Type A electrode is sheath-coated and for cast-iron welding, while electrode type W-3 is thinly coated and for high-speed arc welding.

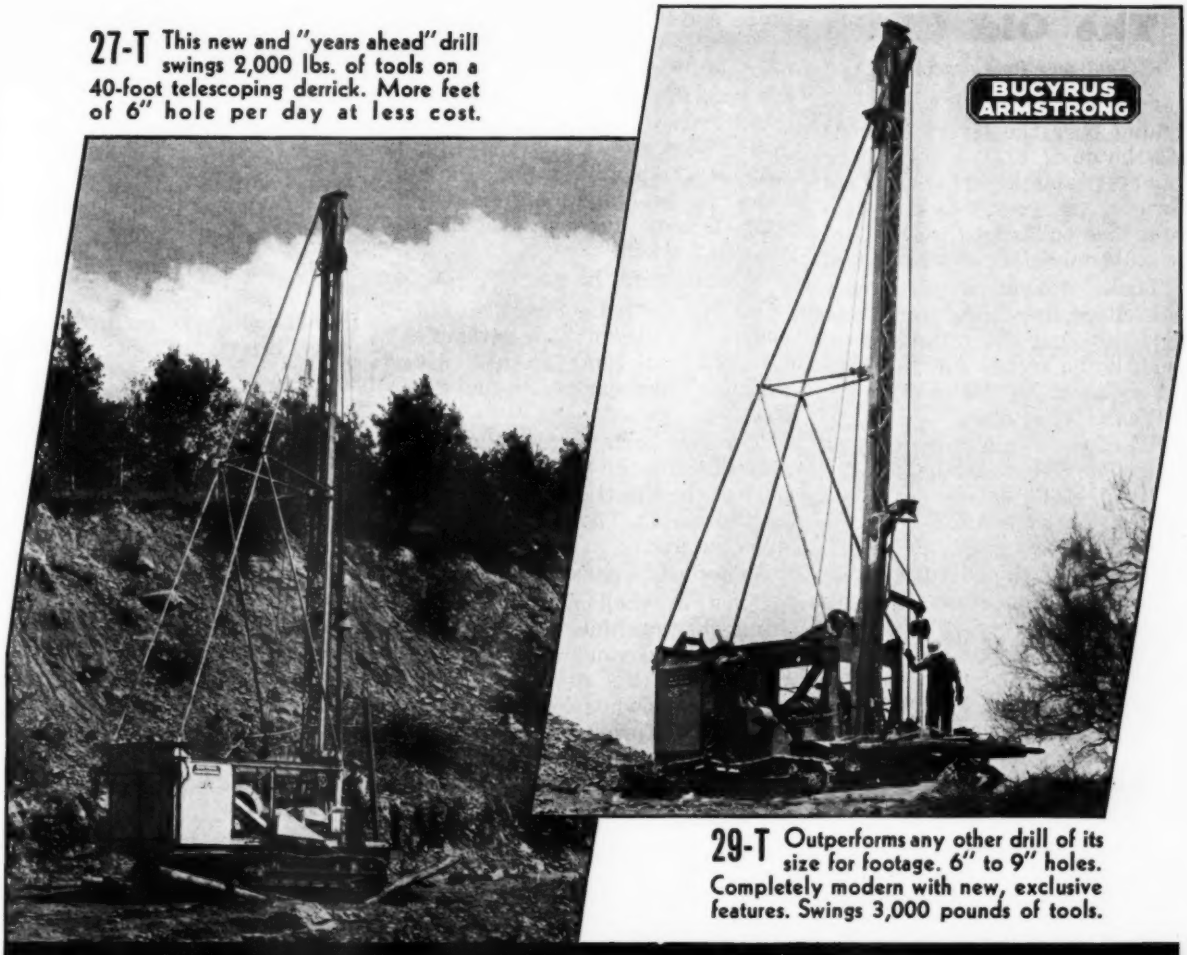
"Seal Cut" Piston Ring

Manufacturers claim the "Seal Cut" design of Pedrick piston ring provides for a positive and permanent seal at the cut or gap of the ring. A matched lap prevents any leakage past the ring at the cut, either down the cylinder bore or around the ring groove. Wear of the cylinder walls does not affect this seal, because the cut is lapped far enough to take up all the opening which wear may cause. Pedrick "Seal Cut" rings are made in all sizes for air compressors, pumps, gas engines and oil engines. According to the maker, they seal the cylinder bore, seal the ring groove, hold high compression, permit no "blow-by," make starting easier and stop dilution and contamination. Pedrick piston rings are made by Wilkening Manufacturing Co. in Philadelphia, Pa., and in Canada by Wilkening Mfg. Co. (Canada) Ltd., of Toronto.

Geophysical Instrument Co.

Through a typographical error, the name of the manufacturer of a recent developed apparatus for discovering underground conditions prior to drilling and excavation was mis-spelled in the August issue, page 421. The correct name appears above. Address —1315 Half Street, S.E., Washington, D. C. Our apologies for careless proofreading.

27-T This new and "years ahead" drill swings 2,000 lbs. of tools on a 40-foot telescoping derrick. More feet of 6" hole per day at less cost.



29-T Outperforms any other drill of its size for footage. 6" to 9" holes. Completely modern with new, exclusive features. Swings 3,000 pounds of tools.

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SOUTH MILWAUKEE, WISCONSIN, U. S. A.

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The Old Girl

(Continued from page 466)

sent a long stream of brown juice arching over the levers and out into the dust.

Buckets staggered back and sat down on the great block of concrete that ballasted the Old Girl. He could only stare at his partner.

"Looks tough, too," Greasy Pete added, becoming garrulous. "You ran your front tumbler off a half-dozen treads and she's sittin' cockeyed to the world."

"Yeah. What else?"

"Well, there ain't no room to work alongside the canyon."

"What else?"

"Ain't that enough?"

"Plenty."

Buckets continued to stare at Greasy Pete. Pete stared after his tobacco. The dust settled over everything. Buckets pulled out the "makin's" and rolled a cigarette, stuck it on his dirt-lined lips, lit it with a well-chewed match. Pete gnawed a corner off his plug.

They heard a car in the distance, and it drew closer, invisible in the gloom. Two headlights appeared in round yellow spots. The car was following the Old Girl's tread marks. It pulled into sight, swung alongside and stopped. A window was partly lowered and a hand waved, beckoning to the men. Greasy Pete saw it and nudged Buckets.

"Wants you," he said.

Bucket showed some of his old spirit. "It's the company car, ain't it? Let 'em come to us." He grinned. "We can't see for the dust."

The car horn blared. Buckets stepped to the Ultimate Six, pushed the throttle and accelerated the motor. The car horn was drowned out.

There was a pause.

Then a small figure stepped from the machine. Even in the dust it was obviously Scotty. The timekeeper. He climbed quickly aboard, and when he got in the cab he was furious. The two men could see that. His gloved hand held a once-white handkerchief to his nose.

"You guys made me climb up here and you—"

"Can't hear you," Buckets shouted.

"Turn that damn' calliope off."

"Eh?"

Scotty motioned unmistakably and emphatically at the Ultimate Six. Buckets shut it off.

Scotty said, "Here, you read it."

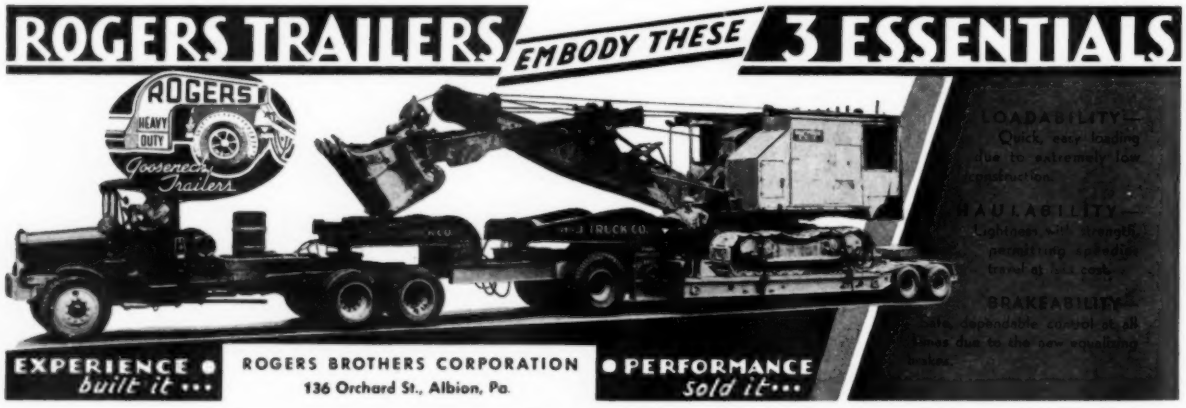
He handed Buckets a telegram. It was brief. It said: "Plans changed. Continue stripping new pit. Gordon, General Manager."

Buckets yelled, "Get outa here!" and made for the timekeeper. Scotty turned, jumped straight from the cab to the ground, scrambled into the car and was gone.

Greasy Pete said, "Huh?"

Buckets ran his fingers through his hair and groaned, "K. C. says keep on stripping the new pit. We gotta go back. And we can't go back. We're broke down." He grinned. "I guess that fools 'em."

Greasy Pete spat.



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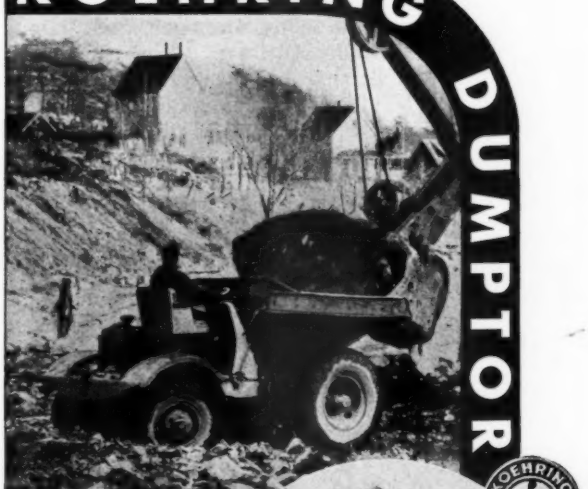

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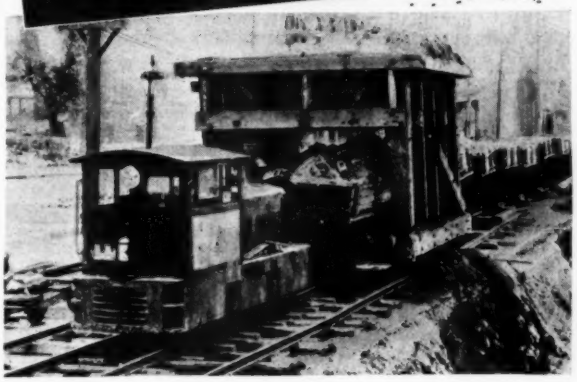

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WHITCOMB LOCOMOTIVES

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Controlled Concrete

(Continued from page 463)

ing only the proper cement. By this means complete control by the District was effected.

In all, nearly 7,000,000 barrels of cement have gone through this procedure, involving 23,000 samples and many times that many tests. Five-pound sample cans of cement, one for every 1,500 barrels, were retained and stored at Banning, where they form a record which may be used for reference at any time in the future.

Inspection in the Field

In the field, inspectors were on all phases of the work at all times when it was in progress, and frequent inspection of all production and handling of aggregate, receipt and use of reinforcement steel, curing compounds, and other materials were maintained. Their duties included field tests of aggregate, proportioning, batching, control of water content, mixing at plant, conveying of materials and concrete to the site of work, and the overhaul of aggregates. They checked all placing operations, such as preparation of subgrade, cleaning and setting forms, structure dimensions, time of placing, compaction, finishing, and made tests for the consistency of concrete. Even the weather was checked and recorded, as information of temperature, humidity, wind, etc., for several days after concrete was placed, was regarded as valuable for future analysis.

Form reports for all field tests and specimens were made and filed in the Banning headquarters.

In addition to these checks in the field, physical tests of all concrete were made in the laboratory. At least one sample from a typical batch of concrete was taken during every shift, placed in 6 by 12-inch tin cans, properly labeled, and sent to Banning. Here it was cured for 28 days and then tested for compressive strength. Some 30,000 specimens were tested for this purpose. The results, besides showing whether or not the concrete met requirements, and indicating where mix adjustments were needed, also formed a general record of the concrete composition of the aqueduct.

Incidental Problems

In addition to the routine acceptance tests many problems of varying magnitude arose during the progress of the work and were successfully solved. For example, there was no way of telling what the concrete that went into the structure was like after it was once placed. They couldn't X-ray it, but they could take sample cores, which amounted to practically the same thing. One of the principal things showed by these cores was a tendency toward lack of compaction in certain typical places. Information as to where more thorough vibration was needed was thus secured. The cores, kept filed in the laboratory storerooms, also form another record for reference in the future.

Another problem was the corrosive alkalis encountered in the soil from Banning to Los Angeles, on the western end of the project. Field tests made in advance of construction revealed that these aggressive salts would likely ultimately disintegrate the concrete and that possibly weak sections might result. Laboratory tests to find a sulphate resisting cement developed the conclusion that cement containing less than 4 per cent C3A and less than 12 per cent of C3A and C4AF would be far more resistant to alkali corrosion than other cements. Due to a particularly favorable combination of raw materials, manufacture of such a cement presented no great difficulties to the Victorville plant of the Southwestern Portland Cement Company. Consequently all cement of this type used by the District came from this mill.

There are many such instances of the efficacious investigation work done by the laboratory. Altogether, its services have formed an essential function in maintaining the high standard of construction which makes the Colorado River Aqueduct one of the outstanding examples of engineering of this or any other time.

All operations of the Metropolitan Water District are under supervision of F. E. Weymouth, General Manager and Chief Engineer; J. H. Burkholder, Assistant General Manager, and Julian Hinds, Assistant Chief Engineer. Testing Engineer Lewis H. Tuthill was in charge of the testing laboratory and the investigations herein noted.

● **Placing steel forms for concrete conduit on the Aqueduct. The same weather conditions making it important to develop special concrete handicapped construction activities during summer months.**

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BUCYRUS ERIE

Book reviews

The Caterpillar Tractor Company, Peoria, Illinois has recently published an excellent book called "Roads, Canals and Embankments with Caterpillar Equipment," written by Frank Nikirk. That portion of the book devoted to roads includes sections on construction, improvement, paving and road surfacing, and maintenance, while the canal section deals with canals constructed with blade or elevated graders and canal maintenance. In addition there are divisions of the book which discuss road construction standards, terracing as means of soil erosion control, and selection of equipment.

A generous use of diagrams and field photographs throughout the publication illustrate the various sections. Readers may obtain their copy of this book, which sells for 50 cents, by writing the Caterpillar Tractor Company, Peoria, Illinois.

A new catalog printed completely in Spanish has recently been published by the Rex Chain Belt Company, 1600 West Bruce Street, Milwaukee. Readers may obtain their copy of the catalog, which describes and illustrates the complete line of Rex construction equipment, by writing the manufacturer and requesting bulletin 324.

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Bulletin 530

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Who, for over 40 years, have created and sold none but equipment of demonstrable superiority in design and manufacture.

Bucket Loaders — Portable Conveyors

Lehigh Safety Shoe Company, Inc., Allentown, Pennsylvania, has published a handbook "Stop Foot Injuries," containing informative material on general industrial safety, including several factory tested suggestions on how industrial injury frequency rates can be reduced. Examples of various types of foot injuries are illustrated and described. Your copy may be obtained by writing the manufacturer.

A new eight-page booklet on U.S.S. High Tensile Steels has been published by the United States Steel Corporation Subsidiaries. It contains technical information which is of particular interest to engineers, and information, written in such a manner as to be readily understood by the layman, of a general nature concerning applications, advantages and fabrication of U.S.S. High Tensile Steels.

Copies may be obtained by writing to Carnegie-Illinois Steel Corporation, 434 Fifth Avenue., Pittsburgh, Pa., or by contacting your nearest district office.

Modern methods for handling the many necessary cleaning operations in truck and tractor motor repairing and fleet maintenance are described and illustrated in a 36-page booklet recently released by Oakite Products, Inc., 14 Thames Street, New York, N. Y., manufacturers of maintenance cleaning materials.

Contractors and engineers may secure copies by writing the manufacturers.

A four-page folder describing Rockford over-center clutches has been released by the Rockford Drilling Machine Division of the Borg-Wagner Corporation. Brief descriptions of the clutches, including the roller cam feature, are contained in the folder. Copies will be sent to readers upon request to the manufacturer.

American Technical Society, Drexel Avenue at 58th Street, Chicago, Illinois, announces the publication of two new books. "Electric Welding," by Potter, which retails for $1.25, and "Air Conditioning, Heating and Ventilating," by Dalzell and Hubbard, which sells for $4.00.

"Fuel Efficiency in Cement Manufacture 1909-1935," has recently been published by the Works Progress Administration, it was announced by Harry L. Hopkins, administrator. The nature of fuel saving techniques and their significance to employment opportunities are illustrated and described in the book.

As part of its safety campaign the Hercules Powder Company, Wilmington, Delaware, has published a series of posters which show the danger and serious accidents which may result from careless handling of powder and other explosives. Manufacturers interested in posting these warnings on their bulletin boards may obtain copies of the posters by writing the manufacturers.

Trade notes

Emsco Derrick & Equipment Company of Los Angeles, California, announces the appointment of N. G. Livingston as Pacific Coast Sales Manager in its Tractor Equipment Division. He will cover the Western Division of the company in his new capacity, and his headquarters will be at the company's general offices in Los Angeles.

The completion of a modern wire rope plant at Muncy, Lycoming County, Pennsylvania, as an additional unit of its expansion and development program was announced by the Jones & Laughlin Steel Corporation, Pittsburgh. This new plant, to be known as the Gilmore Wire Rope Division of the Jones & Laughlin Steel Corporation, began operation recently.

The Broderick & Bascom Rope Company announces the purchase of the business and patents of the Murray Safety Sling Company of Pittsburgh, Pennsylvania. D. Murray, who is the original manufacturer of plaited wire rope safety slings, has sold his patents to the Broderick & Bascom Rope Company and will himself join this company, being in charge of the Murray Safety Sling Division factory at 33 Water Street, Pittsburgh.

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UNIVERSAL GAS TRUCK CRANE. Full revolving. 20' boom. ⅝-yard Kiesler clamshell bucket with teeth. 4-wheel Mack truck. 4-cylinder 4¾"x6½" engine. Good operating condition. Located Chicago. Box 2071-SCC.

UNIVERSAL—THEW Model AC-35, ½-yard gasoline truck crane. 28' boom. ½-yd. Owens digging bucket. Mack truck equipped with dual hard tires rear and pneumatic tires front. Condition good. Located Central New York State. Box 1193-SCC.

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⅜-YARD

BUCYRUS-ERIE 10-B Gasoline shovel. Electric starter. 14" cat treads. Hercules engine, excellent condition, and 10-B trailer good as new. Located North Carolina. Box 2182-SS

BUCYRUS-ERIE 10-B gasoline shovel. Also dragline equipment and ⅜-yard Page bucket. Electric starter and lights. Suitable 5,500' altitude. Hercules engine. Very good condition. Located Colorado. Box 2183-SS

UNIVERSAL—(UNIT) MODEL B ⅜-yd. shovel —¾ swing. Fordson Tractor Power unit. Good condition except minor repairs needed. Located Indiana. Box 2117-SS

½-YARD

BUCYRUS-ERIE — TYPE A, ½-yard steam shovel. Cat mounted. 26' boom clamshell equipment. Located Central Illinois. Box 2007-SS.

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P & H—MODEL 300—½-yard gasoline shovel. Reconditioned. Located Kentucky. Box 1107-SS.

⅝-YARD

BUCYRUS-ERIE TYPE AA ⅝-yard Air Tunnel shovel cat. mounted. Two speeds. Will work in 14' clearance. Reconditioned. Excellent condition. Located New York. Box 2180-SS

BYERS MODEL 128. ⅝-yd. gas shovel and 35' boom dragline, including ½-yd. Page "C" drag bucket. 4-cylinder Diamond T engine. Engine overhauled 1937. Good operating condition. Located Illinois. Box 2087-SS.

GENERAL—⅝-yd. Gas shovel. Good condition. Located Eastern Pennsylvania. Box-2104-SS.

¾-YARD

BUCYRUS-ERIE TYPE B ¾-yd. Caterpillar mounted steam shovel. Located Massachusetts. Box 2123-SS

BUCYRUS-ERIE TYPE B Steam Shovel. ¾-yard Quarry dipper. Cat mounted. New boiler installed late 1935. Good operating condition. Located Georgia. Box 2073-SS.

BUCYRUS-ERIE —— TYPE B, ¾-yard steam shovel and 40' boom clamshell. Cat. mounted. Located Buffalo, New York. Box 2005-SS.

BUCYRUS-ERIE—TYPE B ¾ YD. Caterpillar mounted Extra high-lift steam shovel. Located Chicago. Good working order. Will rent or sell. Box 1100-SS.

BUCYRUS-ERIE TYPE B steam ¾-yard shovel and 36' boom clamshell including ¾-yard Williams clamshell bucket. Located Central New York. Box 1188-SS.

LORAIN MODEL 40—¾-yd. Gas shovel. 16 mo. old. Excellent condition. Located Eastern Pennsylvania. Box 2103-SS.

NORTHWEST MODEL 105 Combination shovel and clamshell. 24' shovel boom. 17½' dipper handle. ¾-yard dipper. 40' clamshell boom. Type "C" Lakewood 1-yard clamshell bucket. Twin City gasoline engine. Reasonably good condition. Located near Chicago. Box 2045-SS.

OSGOOD. COMMANDER. Combination shovel, dragline and clamshell. ¾-yard Rock Type dipper. 35' dragline and clamshell boom. ¾-yard Page drag bucket. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SS.

⅞-YARD

BUCYRUS-ERIE B-2. Extra High Lift shovel. 21'3" boom. 18'4" dipper handle. ⅞-yard dipper. Well cared for. Good condition. Located Rhode Island. Box 2047-SS.

BUCYRUS-ERIE B-2 High Lift Steam Shovel. Single Shaft Cat. Exceptionally good condition. Located Connecticut. Box 2078-SS.

BUCYRUS-ERIE—1035 GASOLINE SHOVEL. Chain Crowd. ⅞-yard Dipper. 26-in. caterpillar treads. Electric starter. Needs some repairs. Located vicinity Boston. Box 1065-SS.

BUCYRUS-ERIE—B-2—HIGH LIFT STEAM shovel. 21'3" boom, 16' dipper handle, ⅞-yard dipper. Single shaft caterpillar. Located Vermont. Box 1135-SS.

1-YARD

BUCYRUS-ERIE 32-B Gasoline combination shovel and 40' boom clamshell. Electric starter. Wisconsin M-3 6-cylinder 5"x6" engine. Excellent condition. Located Washington, D. C. Box 2184-SS

BUCYRUS-ERIE 32-B—Gasoline chain crowd 1-yard shovel. Electric starter. Single shaft cats. Wisconsin 6-cylinder 5"x6" engine. Few minor repairs needed. Otherwise excellent condition. Located near Boston. Box 2061-SS.

BUCYRUS-ERIE—D-2 1 yard Diesel Shovel. Atlas engine. Field reconditioned. Located North Carolina. Box 1079-SS.

BUCYRUS-ERIE 1030 — ELECTRIC TUNNEL shovel. Boom 10 ft. 7 in. Dipper handle 10 ft. 5 in. 1-yd. dipper. Boom hoist 5 ft. 6 in. rear end clearance. 2 motor—power supply 3 phase, 60 cycle, 440 volt. Located Virginia. Box 1068-SS.

BUCYRUS-ERIE 31-B — 1 YARD STEAM SHOVEL. Located Tennessee. Box 1093-SS.

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BUCYRUS-ERIE—31-B STEAM SHOVEL. 22' boom, 15' dipper handle, 1-yard dipper. Now operating, can be demonstrated. Located Alabama. Box 1130-SS.

LORAIN—MODEL 60—1-YARD shovel. Located Southern Virginia. Box 1182-SS

MARION MODEL 7, 1-yard steam shovel. Has not operated in the past five years. New flues recently installed in boiler. Located Buffalo, New York. Box 2006-SS.

NORTHWEST — MODEL 105 — GASOLINE shovel and clamshell—1-yard. Located Massachusetts. Box 1123-SS.

P&H MODEL 600 1-yd. Gasoline shovel. Waukesha engine. Crane equipment also available. Good condition. Located Connecticut. Box 2113-SS

P&H MODEL 600A Gas 1-yard Shovel and 40' boom crane. Electric starter and lights. Waukesha 4 cylinder 6"x7" Model J. L. engine. $1500 recently spent overhauling. Good condition and appearance. Located Central Wisconsin. Box 2084-SS.

1¼-YARD

BUCYRUS-ERIE 34-B Diesel combination 1¼-yard shovel and 45' boom dragline including 1⅛-yard drag bucket and Kohler light plant. 30" cat. treads. Caterpillar D-11,000 engine. Used only about 8 months. Excellent condition and appearance. Located Kansas. Box 2172-SS

BUCYRUS-ERIE GA-3 Gas-Air 1¼ yard shovel. Single shaft cat. Electric starter. Waukesha 4-cylinder 6¼"x8" engine. First class condition. Located near St. Louis. Box 2162-SS.

BUCYRUS-ERIE 34-B Diesel Chain crowd shovel. Special 1½-yd. dipper. Caterpillar Diesel D-11,000 6 cylinder 5¼"x8" engine. 30" cat. treads. Wired for electric lights. Excellent condition. Located Chicago. Box 2129-SS

BUCYRUS-ERIE GA-2 Gas-Air shovel. Single shaft cat. Waukesha 6¼"x8" 4-cylinder engine. $3,000 repairs added June 1937. Excellent condition. Located Kansas. Box 2126-SS

BUCYRUS-ERIE GA-3 Gas Air 1¼-yd. shovel. Waukesha 4-cylinder 6¾"x8" engine. Good operating condition. Now operating Arizona. Box 2090-SS.

BUCYRUS-ERIE GA-2 Gas-Air 1¼-yd. shovel. Waukesha 6½"x8" engine. Single shaft cat. General appearance and condition good. Located North Carolina. Box 2108-SS.

FOR SALE

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BUCYRUS-ERIE. GA-2, Gas-Air. 1¼-yard shovel. Electric starter. Waukesha W.L. 4-cylinder 6¼"x8" engine. Single shaft cat. Extensively repaired recently. Located Texas. Box 2030-SS.

BUCYRUS-ERIE E-2 shovel and dragline. 1½-yard Plate dipper. 45' boom plus 10' extension. 1¼-yard Page drag bucket. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SS.

TWO—BUCYRUS-ERIE—GA-3, GAS-AIR 1¼-yard shovels, Wisconsin D-2—6 cyl. 5¼"x6½" Engines. Good condition. St. Paul, Minnesota. Box 1097-SS.

BUCYRUS-ERIE 41-B — 1¼-YARD STEAM SHOVEL. Located near Boston. Electric light plant. Very good price. Box 1096-SS.

BUCYRUS-ERIE—41-B—STEAM SHOVEL. 21' boom, 15' dipper handle, 1¼-cubic yard dipper. Now operating. Will demonstrate. Located Alabama. Box 1131-SS.

BUCYRUS-ERIE GA-3—Gas-Air 1¼-yard high lift shovel and 45' boom clamshell machine. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Located New Mexico. Box 2148-SS.

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South Milwaukee, Wis.

LIMA MODEL 101. 1¼-yard gas shovel. 50' boom dragline. Excellent condition. Located Texas. Box 2029-SS.

2—LIMA MODEL 101. 1¼-yard gasoline shovels. 26' boom. 17' dipper handle. Waukesha Model J. K. 6½"x7" engine. Recently rebuilt. Excellent condition. Located Texas. Box 2042-SS.

LORAIN 75-A 1¼-yd. Gas shovel. Good operating condition. Located near Boston. Box 2118-SS

2 MARION Model 450—Steam Shovels. Good condition. Located Connecticut. Box 1154-SS.

MARION MODEL 32—1¼-yd. steam shovel. Boiler inspected February 1, 1938. Machine in good condition. Located Eastern Pennsylvania. Box 2101-SS.

OSGOOD. 1¼-yard gasoline shovel. 1-yard dipper also available. 4-cylinder Leroi gas engine. Only operated three months since $2,000 repairs applied. Excellent condition. Located Texas. Box 2043-SS.

1½-YARD

BUCYRUS-ERIE 37-B Diesel Chain crowd shovel. 1½-yd. 30" cat. treads. Caterpillar D-13,000 6-cylinder 5¾"x8" engine. Wired for lights. Practically new condition. New machine guarantee. Available 30 days. Located Western Pennsylvania. Box 2128-SS

BUCYRUS-ERIE 37-B Gas 1½-yd. shovel. Electric starter and battery lights. Gasoline fuel pump. Wisconsin 6-cylinder 5½"x6½" engine. Machine rebuilt 1933. Good working condition. Located Eastern Pennsylvania. Box 2091-SS.

BUCYRUS-ERIE—42-B STEAM shovel. 1½-yard Vanderhoef quarry dipper. Very good mechanical condition. Can be demonstrated. Located Georgia. Box 1149-SS.

BUCYRUS-ERIE 37-B—1½ yard Chain crowd gas shovel. Wisconsin D-3 engine. Located Minnesota. Box 2075-SS.

P&H MODEL 700-B. 1½-yd. Gasoline shovel. Waukesha engine. Good condition. Located Connecticut. Box 2114-SS.

1¾-YARD

One 701 Koehring shovel equipped with a 1¾-yard special rock dipper and D13000 Diesel engine, purchased 1936. Can be seen on the job near Corydon, Indiana. Box 2143-SS.

BUCYRUS-ERIE 43-B Gasoline chain crowd shovel. 22' boom. 17' dipper handle. 1¾-yard dipper. Also 60' boom dragline equipment including 1¾-yard AX drag bucket. Wisconsin 6-cylinder 6"x7" engine. Used less than 90 days. Excellent condition. Located northern California. Box 2185-SS

BUCYRUS-ERIE 43-B late model 1¾-yd. chain crowd shovel. Electric starter. 1½ K.W. Kohler light plant. Buda-Lanova 6-cylinder 5¼"x7" Diesel engine. Located Central New York State. Excellent condition. Box 2019-SS.

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 2153-SS.

2-YARD

MARION MODEL 480—2-yd. Steam shovel. Vertical boiler. Boiler inspected February 1, 1938. Excellent condition. Located Eastern Pennsylvania. Box 2102-SS.

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

BUCYRUS-ERIE 10-B Gasoline dragline and ¾-yard Page bucket. Also shovel equipment. Electric starter and lights. Suitable 5,500' altitude. Hercules engine. Very good condition. Located Colorado. Box 2183-SD

½-YARD

SPEEDER 42' Boom Dragline and ½-yard drag bucket. Caterpillar Diesel engine. Located Wyoming. Box 2178-SD

UNIVERSAL GASOLINE dragline. ½-yd. capacity. Crawler mounted. Located Indiana. Box 2127-SD

⅝-YARD

BYERS MODEL 128. ⅝-yd. Gas dragline 35' boom including ½-yd. Page "C" drag bucket. 4-cylinder Diamond T engine. Engine overhauled 1937. Good operating condition. Located Illinois. Box 2087-SD.

¾-YARD

NORTHWEST MODEL 105 GAS—40' boom dragline and clamshell, including Page "C" drag bucket. Climax engine. Reasonably good operating condition. Located Atlanta, Ga. Box 995-SD.

OSGOOD. COMMANDER. Combination dragline, shovel and clamshell. 35' dragline and clamshell boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SD.

⅞-YARD

BUCYRUS-ERIE 1035 Gasoline 40' boom dragline and clamshell, including 1-yd. dragline and clamshell buckets. 26" cat. treads. Waukesha engine. Recently overhauled. Located Colorado. Box 2177-SD

P&H MODEL 206-B combination dragline and clamshell. 40' boom. Waukesha engine. Good condition and appearance. Located Florida. Box 2105-SD.

1-YARD

BUCYRUS-ERIE 30-B Diesel 40' boom dragline. Atlas Diesel 3-cylinder 8½"x10½" engine. $1,500 repairs recently applied. Excellent condition. Located near Chicago. Box 2132-SD

BUCYRUS-ERIE 32-B Gas 50' boom dragline and 1-yd. "U" Drag bucket. Electric starter. Wisconsin engine. Good operating condition. Located Eastern Pennsylvania. Box 2088-SD.

BUCYRUS-ERIE — D-2 — DIESEL DRAGLINE. Atlas engine. Located Texas. 40' Boom, 1¼ yd. Page Bucket. Field reconditioned. Excellent mechanical and operating condition. Box 1020-SD.

1¼-YARD

BUCYRUS-ERIE 34-B Diesel combination 1¼-yd. 45' boom dragline and shovel, including 1¼-yd. drag bucket and Kohler light plant. 30" cat. treads. Caterpillar D-11,000 engine. Used only about 8 months. Excellent condition and appearance. Located Kansas. Box 2172-SD

BUCYRUS-ERIE E-2 Diesel 45' boom dragline and 1¼-yard Page bucket. Fair working condition. Located Kansas. Box 2173-SD

BUCYRUS-ERIE E-2 dragline and shovel. 45' boom plus 10' extension. 1¼-yard Page drag bucket. 1½-yard plate dipper. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SD.

LIMA MODEL 101, 1¼-yd. gas 50' boom dragline and shovel. Excellent condition. Located Texas. Box 2029-SD

P & H—MODEL 210—55' boom dragline including 1¼-yard Page bucket. Gas powered. Located South Dakota. Box 1172-SD

1¾-YARD

BUCYRUS-ERIE 43-B gasoline 60' boom dragline, including 1¾-yard AX drag bucket. Also chain crowd shovel equipment. 22' boom. 17' dipper handle. Wisconsin 6-cylinder 6"x7" engine. Used less than 90 days. Excellent condition. Located Northern California. Box 2185-SD

2-YARD

BUCYRUS-ERIE 45-B Diesel Dragline. 75' boom. Buda DC-27 6-cylinder 6¼"x8¾" engine. Electric starter. 2¼ yd. Omaha drag bucket. Long cat side frame. Kohler light plant. Good operating condition. Located Nebraska. Box 2111-SD.

NORTHWEST MODEL 8 Gasoline dragline. 60' boom. 2-cu. yd. Page bucket. Twin City 7¾"x9" engine. 1500 Watt Kohler light plant. $4,000 repairs and overhauling recently applied. Excellent condition. Located near Memphis, Tenn. Box 2138-SD

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⅜-YARD

BAY CITY—¾-YARD GAS CLAMSHELL. Located near Boston. Box 1084-SCC.

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½-YARD

BUCYRUS-ERIE — TYPE A. ½-yard steam clamshell and shovel. 26' clamshell boom. Cat. mounted. Located Central Illinois. Box 2007-SCC.

⅝-YARD

BROWNHOIST 40' boom steam locomotive crane. Standard gauge car wheel mounting. Fair condition. Located vicinity Chicago. Box 2135-SCC

P & H MODEL 204. 35' boom gasoline clamshell. ⅝-yard Kiesler clamshell bucket. Waukesha engine. New cab. Generally very good condition. Located Chicago. Box 2036-SCC.

¾-YARD

BUCYRUS-ERIE—TYPE B, ¾-yard, 40' boom steam clamshell and shovel. Cat. mounted. Located Buffalo, New York. Box 2005-SCC.

BUCYRUS-ERIE TYPE B, steam, ¾-yard 36' boom clamshell and shovel, including ⅝-yard Williams clamshell bucket. Located Central New York. Box 1188-SCC.

NORTHWEST MODEL 105 GAS—40' boom clamshell and dragline, including Page "C" drag bucket. Climax engine. Completely reconditioned. Located Atlanta, Ga. Box 995-SCC.

NORTHWEST MODEL 105, combination clamshell and shovel. 40' clamshell boom. Type "C" Lakewood 1-yard clamshell bucket. 24' shovel boom. 17½' dipper handle. ¾-yard dipper. Twin City gasoline engine. Reasonably good condition. Located near Chicago. Box 2045-SCC.

OSGOOD. COMMANDER. Combination clamshell, dragline and shovel. 35' clamshell and dragline boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SCC.

⅞-YARD

BUCYRUS-ERIE 1035 Gasoline 40' boom clamshell and dragline including 1-yd. clamshell and dragline buckets. 26" cat. treads. Waukesha engine. Recently overhauled. Located Colorado. Box 2177-SCC

P&H MODEL 206-B Combination clamshell and dragline. 40' boom. Waukesha engine. Good condition and appearance. Located Florida. Box 2105-SCC.

1-YARD

BROWNHOIST 50' boom steam locomotive crane. Standard gauge car wheel mounted. Overhauled 1937. Located vicinity Chicago. Box 2136-SCC

BUCYRUS-ERIE 32-B gasoline combination 40' boom clamshell and shovel. Electric starter. Wisconsin M-3 6-cylinder 5"x6" engine. Excellent condition. Located Washington, D.C. Box 2184-SCC

BUCYRUS-ERIE — GA-2 — GAS-AIR 45' Boom Clamshell Machine. Good Operating Condition. Located St. Paul, Minn. Box 1024-SCC.

BUCYRUS-ERIE — GA-2 GAS AIR Clamshell. 45' boom. Single Shaft Caterpillar. Waukesha 4 cylinder 6¼"x8" engine. Rebuilt since original manufacture. Good operating condition. Located New Jersey. Box 1104-SCC.

NORTHWEST—MODEL 105—gasoline clamshell and shovel—1-yard. Located Massachusetts. Box 1123-SCC.

P&H MODEL 600, 1-yd. gasoline shovel. Crane equipment also available. Waukesha engine. Good condition. Located Connecticut. Box 2113-SCC

P. & H. MODEL 600—40' BOOM GAS clamshell and 1-yard shovel. Waukesha JL-6"x7" Engine. Located North Carolina. Box 1095-SCC.

P&H MODEL 600A 1-yard 40' boom crane and gas shovel. Electric starter and lights. Waukesha 4-cylinder 6"x7" Model J. L. engine. $1500 recently spent overhauling. Good condition and appearance. Located Central Wisconsin. Box 2084-SCC.

1¼-YARD

BUCYRUS-ERIE GA-3 — Gas-Air 1¼-yd. 45' boom clamshell and high lift shovel. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SCC.

LINK-BELT, MODEL K-2. Gas crane. 50' boom. Also 2 extra 20' inserts to make 90'. Weight 67,000 lbs. Located St. Paul, Minn. Box 2013-SCC.

1½-YARD

2—BUCYRUS-ERIE 37-B's Gasoline Special Clamshell Machines. Vertical Tagline. Accelerator control on engine. Special hoist gear and pinion to increase line speed. 30" Cat. treads. Electric starter. 10,000-lb. counterweight. Wisconsin "E" 6-cylinder 6"x7" engine. Good operating condition. Located Boston. Box 2160-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

BUCYRUS-ERIE 50-B, 2-yd. steam shovel. Good operating condition. Located Central New York State. Box 2020-LSD.

BUCYRUS-ERIE 50-B Diesel Dragline. 50' boom. 2-yard Page "M" drag bucket. Kohler Light Plant. Atlas Engine. Overhauled completely 1937. Actually used only 4 years. Good condition. Located Illinois. Box 2083-LSD.

BUCYRUS-ERIE 50-B Diesel Combination shovel and dragline. New 1¾-yd. Esco dipper. 50' dragline boom including 1½-yd. Page drag bucket. Atlas 4-cylinder 9"x12" engine. Good working condition. Located Montana. Box 2107-LSD.

BUCYRUS-ERIE — 52-B — DIESEL 2¼ yard Shovel and Dragline. Atlas engine. Good condition. Located Eastern Pa. Box 1039-LSD.

2—BUCYRUS-ERIE 52-B's Ward Leonard Electric combination shovel and dragline. 30' shovel boom 18' dipper handle 2¼-yd. dipper. 70' boom dragline equipment and 2¼-yd. drag bucket. 3 motors—3 phase 60 cycle 2300 volt. 2 flood lights. Very good condition. Located Eastern Pennsylvania. Box 2094-LSD.

BUCYRUS-ERIE 55-B—Extra High Lift Diesel Shovel. 35-ft. boom. 22-ft. dipper handle, 2 cu. yd. Bowl Door dipper. Caterpillar mounted. Kohler light plant. Atlas Diesel engine. Used about three months. Just like new. Located Eastern Pennsylvania. Box 1069-LSD.

BUCYRUS-ERIE — 75-B Electric Combination Shovel and Dragline. 29-ft. shovel boom, 20-ft. dipper handle, 2½-yard dipper, 85-ft. dragline boom with mast suspension. Suitable for power supply, 3 phase, 60 cycle, 2300 volt. Induction motors. Said to be in excellent working condition. Located Eastern Pennsylvania. Box 1058-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 2164-LSD.

BUCYRUS-ERIE—CLASS 24 DIESEL dragline. 130-ft. boom, 4 cu. yd. bucket. Truck mounted. 165 h.p. Anderson Diesel engine. Friction drive. Said to be in good operating condition. Located on Mississippi River near New Orleans convenient for loading on barge. Box 1074-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard buckets. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 2149-LSD.

BUCYRUS-ERIE 95-C. 3-yard steam shovel. Cats. installed 1925. Fair condition. Located Kansas. Box 2050-LSD.

BUCYRUS-ERIE — 100-B — STEAM SHOVEL. 3 yard Dipper. Revolving machinery, very good condition. Located Montreal, Canada. Box 1041-LSD.

2—BUCYRUS-ERIE 100-B steam shovels, worked only 15 months. Also, 2 Ingersoll-Rand Diesel compressors. Very low prices for immediate sale. H. W. Nelson, 1 Wall St., New York.

BUCYRUS-ERIE 100-C. 3-yard steam shovel. Cat. mounted. Fair condition. Located Kansas. Box 2049-LSD.

BUCYRUS-ERIE 175-B 2 Motor AC Electric Dragline. Truck Mounted. 125' boom. 1 each 4-, 5-, and 6-yd. drag buckets. Chain drive from main motor to intermediate shaft. Extra rotors for main and swing motors and other spare parts. 3—75 KVA 60 cycle 2200/220/440 volt transformer mounted on machine. Power supply 3 phase 60 cycle 440 volt. Completely overhauled since received from factory. First class operating condition. Located Kansas. Box 2082-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 2152-LSD.

CLASS 320 STEAM DRAGLINE, 144-foot boom. 8-yard bucket. Located on Illinois river. A good buy. Box 2155-LSD.

BUCYRUS-ERIE — TOWER EXCAVATOR. 130' head tower. 50' tail tower. 12-yard bottomless bucket. Electrical equipment 3 phase 60 cycle 4000 volts Ward Leonard. WILL RENT. Located Louisiana. Box 2069-LSD.

BUCYRUS-MONIGHAN 1½-T Diesel dragline. 60' boom. Located Kansas. Box 2168-LSD

BUCYRUS-MONIGHAN 2-T Diesel Dragline. 70' boom. Located Kansas. Box 2169-LSD

BUCYRUS-MONIGHAN 2-W Diesel dragline. 70' boom. Located Louisiana. Box 2170-LSD

BUCYRUS-MONIGHAN 3-T Diesel dragline. 77' boom. Located Louisiana. Box 2171-LSD

BUCYRUS-MONIGHAN 3-T DIESEL dragline. 80-ft. steel boom, 3 cu. yd. drag bucket, 120 h.p. Fairbanks-Morse type "YVA" engine. 1500 watt Kohler light Plant. Working at Little Rock, Ark. Box 1056-LSD.

BUCYRUS-MONIGHAN—MODEL 4-W—4-yard Diesel Dragline. 110' Boom. Good Condition. Located Nebraska. Box 1047-LSD.

BUCYRUS-MONIGHAN 4-T Diesel Dragline. 150' boom. 1 each 3-cu. yd. and 4-cu. yd. buckets. Fairbanks-Morse 240 HP engine. Located Southern Illinois. Box 2157-LSD.

FOR SALE

Address all box numbers c/o EXCAVATING engineer . . . . . at South Milwaukee, Wisconsin

LARGE SHOVELS AND DRAGLINES
2 Yards and Over continued

BUCYRUS-MONIGHAN 4-W Walking dragline, 80' boom 5½ yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 2150-LSD.

BUCYRUS-ERIE 5-W Diesel Dragline. 90' Boom. Electric swing. Vortex Air Oil Cleaners. Electric fan in operators platform. 5-yd. "Y" drag bucket. Fairbanks Morse 250 HP Type 33-D 5-cylinder 10"x10½" pump scavenging engine. Auxiliary Waukesha gas engine. Good working condition. Located Colorado River Aqueduct near Indio, Cal. Available March 15. Box 2079-LSD.

BUCYRUS-MONIGHAN 5-W Diesel Dragline. 80' Boom. Electric swing. Vortex Air Oil Cleaners. Electric fan in operator's platform. 6-yd. "Y" drag bucket. Fairbanks Morse 250 HP Type 33-D 5-cylinder 10"x10½" pump scavenging engine. Auxiliary Waukesha gas engine. Good working condition. Located Colorado River Aqueduct near Indio. Cal. Available March 15. Box 2080-LSD.

BUCYRUS-MONIGHAN MODEL 6160—Diesel Dragline. 160' boom. 6-yard drag bucket. Fairbanks-Morse Diesel engine. $15,000 extras added since machine was recently purchased. Will rent. Located Montana. Box 2068-LSD.

MARION MODEL 60. 2½-yard steam shovel on railroad trucks. Good appearance and condition. Located Kansas. Box 2051-LSD.

MARION — MODEL 70-E — 3½ yard Electric Shovel. Railway truck mounted. Power Equipment, 3 Phase, 60 cycle, 2300 volt. Good condition. Located Ohio. Box 1050-LSD.

MARION—MODEL 350—8 yard Electric Shovel. Power equipment, 3 Phase, 60 cycle, 2300 volt — Ward-Leonard Control. Mounted on railway trucks. Good condition. Located Minnesota. Box 1049-LSD.

PAGE—MODEL 220—2½ yard Diesel Dragline. 85' Boom. Good operating condition. Located Iowa. Now operating. Box 1052-LSD.

PAGE — MODEL 220 — Electric dragline. 90' boom, 3½-yard Page R.C. drag bucket. Box 1124-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel, 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 2151-LSD.

LOCOMOTIVES

STANDARD GAUGE LOCOMOTIVES BARGAINS

1—Baldwin 45-ton 17x24
2—Baldwin 77-ton 19x26
9—Baldwin 51-ton 17x24
4—American 60-ton 20x26
Located in Minnesota.
Box 2147-ME.

MISCELLANEOUS EQUIPMENT

SHOVEL ATTACHMENT

1½-Yd. Dipper, Dipper Stick, Boom for Link-Belt K-44, K-38 or K-42 shovel. Used only few months. Excellent condition. Bargain Price.

ARMOUR FERTILIZER WORKS
Chicago Heights, Ill.

1 HOLT MODEL 50 Gas Tractor. Located Illinois. Box 2159-ME.

1—20-TON all steel Guy derrick. 80' mast. 75' boom complete with 6 Guy cables approximately 250' long. Includes Dake steam engine driven winch bolted on side of mast complete with load and cables. Also electric motor in addition to Dake engine. Hand swing. Also included one Westinghouse cross-compound steam driven air compressor. Approximate weight 20,000 lbs. Located Wisconsin. Box 2156-ME.

LOCOMOTIVE CRANES

4—Standard gauge locomotive cranes, three —20-ton, one—10-ton. Offered at bargain prices. Located Minnesota.
Box 2146-ME.

BROWNHOIST Steam Locomotive crane. 44' boom. 8-wheel standard gauge MCD coupling. Lifting capacity 20,000 lbs. at 20' radius. One each 1-yd. and 2-cu. yd. clamshell buckets available. Located Wisconsin. Very good condition. Box 2137-ME

PLACER MINING EQUIPMENT, consisting of complete washing plant with trommel screen, pumps, stacker, etc. and a Speeder ½-yd. 42' boom Diesel dragline including ½-yd. drag bucket. Excellent condition. Located Wyoming. Box 2134-ME

If You Do Not Find What You Want Listed—Write Us
EXCAVATING engineer
South Milwaukee, Wis.

BARGAIN PRICES

2—14 Cu. Yd. LaPlante-Choate Wagons
2—75 Caterpillar-Diesel Tractors
(Above equipment like new)
1—Model 71 Keystone Well Drill
1—2¼ Cu. Yd. Page Dragline bucket, A-1 condition
1—1½ Cu. Yd. Page Dragline bucket, A-1 condition
Box 2140-ME.

NEW ELECTRIC MOTORS AND ACCESSORIES BARGAIN PRICES

A large variety of power sizes and power characteristics; also switches, controls, etc. Write us your requirements.
Box 2100-ME.

FRUEHOFF SEMI-TRAILER with 8' by 40' Deck. (Can be shortened.) Single rear axle with 4 wheels each with 36"x10" solid rubber tires. Air Brakes. 16 ton capacity. Excellent condition. Located New York. Box 1160-ME.

DRAG BUCKET

BUCYRUS-ERIE 1½-YARD Type "Y" Drag Bucket. Good condition. Located Kansas. Box 1166-ME.

DRAGLINE EQUIPMENT

72-ft. Dragline Boom and Fairlead—Hydraulic Equipment—1 Hoist Drum—1 Drag Drum—1 Boom Suspension, Sway Brace and Suspension Cables. All suitable for application to Bucyrus-Erie Model 75-B Machine. Located Eastern Pennsylvania. Box 1060-ME.

HAISS EXCAVATOR — C7097, June 1930. Weight 11 tons. Needs new teeth. 33" per minute crowding. Price $1800. Box 990-ME.

CAR TRANSPORTER

CAR-TRANSPORTER or stacker with reach of 135' and dumping height of 75'. Equipped with 4-yard aluminum car. Caterpillar-mounted and suitable for use with shovel having per hour output of 250 yards. Electric drive, 3-phase, 60-cycle, 4000-volt current. This car transporter is in excellent condition and priced to sell. Located near Kansas City, Missouri. Box 2010-ME.

SHOVEL EQUIPMENT—Late design—suitable for Bucyrus-Erie 52-B Diesel. Only handled about 4,000 yards material. Equipment located Alabama. Box 1113-ME

FRONT FOR 32 MARION

1½ CU. YD. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 2165-ME.

INDUSTRIAL STEAM WRECKING DERRICK. Non-propel. Rating 50 tons at 20' with outriggers. Located Nebraska. Box 1171-ME

BARBER-GREENE—MODEL B-44 ditcher. Located North Carolina. Box 1180-ME

KOEHRING DRAG SHOVEL equipment for Model 301 machine. Used very little. Low price. Located Eastern New York State. Box 1181-ME

USED CONTRACTORS EQUIPMENT

1—Model 100 Lincoln Revolver with 100' boom and 12' Gantry.
2—275 Koehring Mixers with Electric motors.
1—200-ton Blaw-Knox Bin with weighing batchers, cement scale and push button control.
1—Robinson Pneumatic cement unloader with silo.
1—20-ton Whitcomb Gasoline Dinkey, overhauled.
4—18-ton Steam Dinkeys, overhauled.
12—30-yd. Western Lift Door Air Dump cars.
4—30-yd. Koppel Drop Door Air Dump cars.
26—16-yd. K. & J. Lift Door Air Dump cars.
6—20-yd. K. & J. Lift Door Air Dump cars.
5—2-cu. yd. Blaw-Knox Roller gate Concrete Buckets.
7—70-ton 20x36 Baldwin Switchers.
3—Jordan spreaders excellent condition.
Located Mississippi valley. Box 2011-ME.

DRAG SHOVEL EQUIPMENT—consisting of 18' boom, 7'6" dipper handle and ½-yd. front-opening dipper suitable for application to Bucyrus-Erie 1020 shovel. Located Rhode Island. Box 2003-ME.

EUCLID-TUWAY 11-CU. YD. dump wagon. Hydraulic hoist. Worked only 320 hours. Located Central New York State. Box 1189-ME.

ERIE AGGREMETER BIN—80-ton capacity with 3 compartments, including weighing scales. Only handled 10,000 tons. Located Central New York State. Box 1190-ME.

SURPLUS MINE EQUIPMENT BARGAIN PRICES

Write for prices of this equipment. Save money. Located in Minnesota.
5—Boilers, locomotive and horizontal return tube types, 150 H.P.
14—Flat cars, 36" gauge, 18-ton.
3—Crushers, jaw, 44x28, 36x24 and Universal.
1—Motor, 135 H.P. squirrel cage, 1150 r.p.m., 220 v., 3 ph., 60 cy., A. C.; compensator.
3—Rotary converters, 300 Kw., HCC-6-300-1200, Forms P, D, & V, 6 and 3 phase.
1—Switchgear for 3-phase rotary converter, complete, semi-automatic.
3—Transformers, 300 Kw., 66,000 V. Primary, reconnected for 22,000 V. Primary.
1—Ainley placer gold machine, complete. 4-bowl with feed hopper for dragline operation. 40-50 tons per hour.
3—Hoists, double and single drum.
1—Bucket loader.
8—Pumps, steam (1 gas engine driven) from 49 to 3700 g.p.m.
1—Tractor, Twin City No. 12-20.
1—Water softener, 5 ft., complete.
120—Batch boxes, oak, 55 cu. ft.
2—Drums mine hoist, dia. 50", width 40", flange 7", capacity 400' one-inch rope.
Box 2145-ME.

BLAST-HOLE DRILLS

14—Sanderson-Cyclone Model 14, non-traction—six Model 14-SR, traction type, electric blast-hole drills. Also six Loomis Clippers—Models 4 and 44, steam traction. All in good condition, available for immediate shipment. Located New York. Priced to sell. Box 2167-ME